Top Performance Tips for Your Table Saw

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Vol. 30 / No. 179

3 Ways to Create Thin Strips on the Table Saw

Discover the Secret to a Glass-Smooth Finish

Create Graceful Shapes out of Wood

BUILD A CRAFTSMAN CLASSIC

- Solid Mortise & Tenon Joinery
- Quartersawn Oak
- Heavy-Duty Construction

PLUS!

How to Choose the Best Lumber for Your Projects

A Publication of August Home Publishing

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Here's an easy-to-build project that still offers a great range of woodworking experiences. You start with some basic joinery, then get to learn a new skill — bent lamination.

designer series project DESIGNER'S NOTEBOOK

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Who says that a practical file cabinet can't also look great? But the classic appearance isn't all this project has to offer. The challenge of building it will keep you on your toes.

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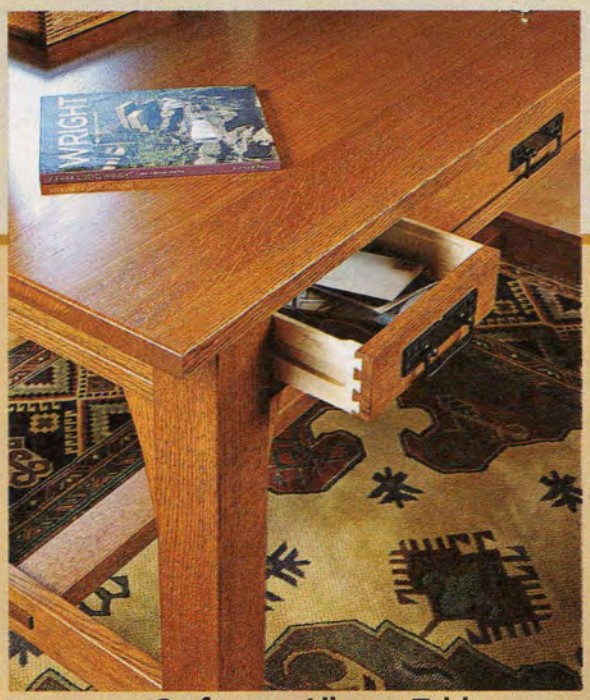
heirloom project

Craftsman Library Table 30

This library table gives you everything you could want in a project. The design is traditional, the woodworking is down-to-earth, and the end result will be a treasured heirloom.



Craftsman Library Table page 30

editor's note
Sawdust

When I was a boy, once a week our class would go to the school library. Now, I don't remember too many of the books I read, or the studying that I supposedly did. But I do remember a couple of things about that library. The first is the big, heavy, oak library tables that we all sat around. They were so wide that you could spread all your papers and books out and still have room to spare. Those tables seemed old even when I was a kid. But I'd be willing to bet they're still in use today.

The Craftsman table featured on the cover of this issue is inspired by the sturdy tables that you used to find in just about every library. And just like the originals, our library table features classic details, heavy-duty joinery, and solid oak construction that's sure to last for generations. Now, you may not have a library in your home, but I think you'll find that this table is ideal as a desk or workspace.

The second thing I remember seeing in the library was the large bank of card catalog drawers. It was almost impossible to resist the urge to pull open one of the drawers every time you walked past them. Well, we don't have a card catalog in this issue, but we do have something similar (and just as tempting to open). It's a storage cabinet that *looks* like a card catalog. The difference here is that when you go to pull open one of the drawers, you discover not a card catalog, but a cleverly disguised file cabinet.

I'd like to mention one other thing. We've made some improvements to our online customer service page. It's been updated to make it easier and faster to change your home and e-mail addresses, renew your subscription, or pay a bill. Plus, you can contact a representative about a problem, submit a tip, or send us a question you'd like answered. Check out *WoodsmithCustomerService.com* and let us know what you think.

Terry

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This symbol lets you know there's more information online at www.Woodsmith.com. There you'll see step-by-step videos, technique and project animation, bonus cutting diagrams, and a lot more.

Tips & Techniques

Palm Router Table for Band Saw

It occurred to me that a palm router mounted in a table would be the perfect answer for making some thin molding. So I decided to build a table dedicated to my palm router. The question was, where to put the table.

I've seen several plans for adding a router table to the extension wing of a table saw, but that wasn't an option on my saw. However, it did get me thinking about other possibilities.

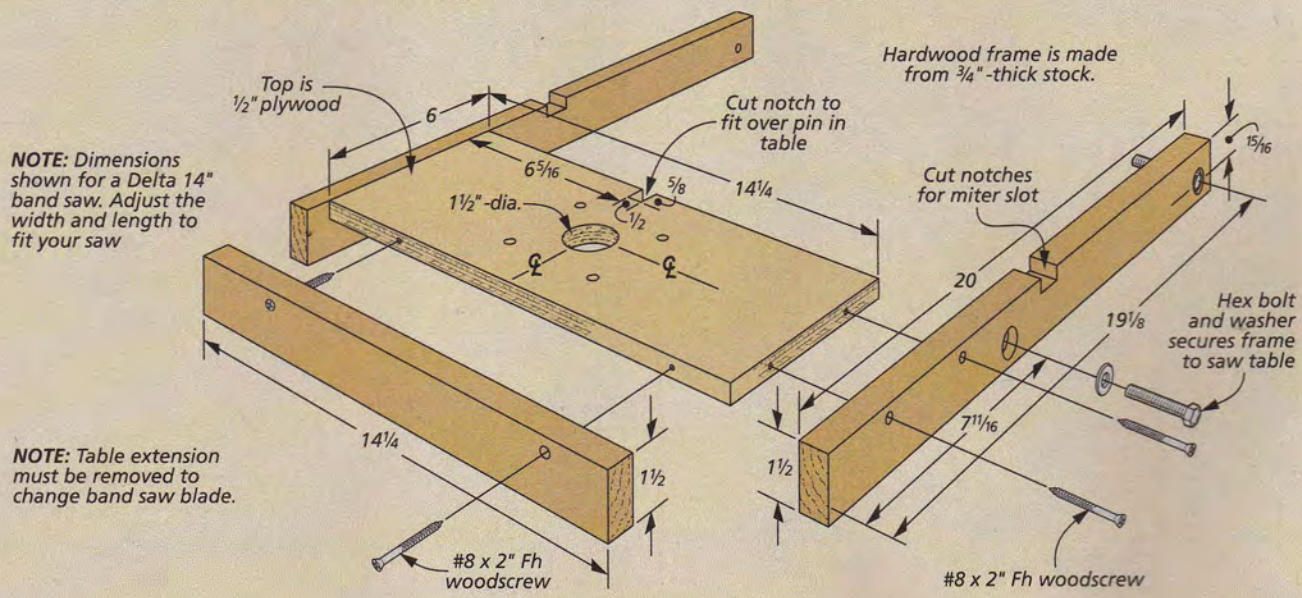
The solution I came up with was to attach a router table to the table of my band saw, as shown in the photo above. As an added bonus, it nearly doubled the surface area of the band saw table.

I started by assembling a hardwood frame to fit around the tabletop. I also cut dadoes in the frame to accommodate the miter gauge track.

A plywood top fits into the frame. You can bolt the table in place using the band saw fence holes.

This design has one more advantage: Since it's taller than the average router table, it's easier to work at without having to bend over.

Jeff Webster
Lexington, South Carolina

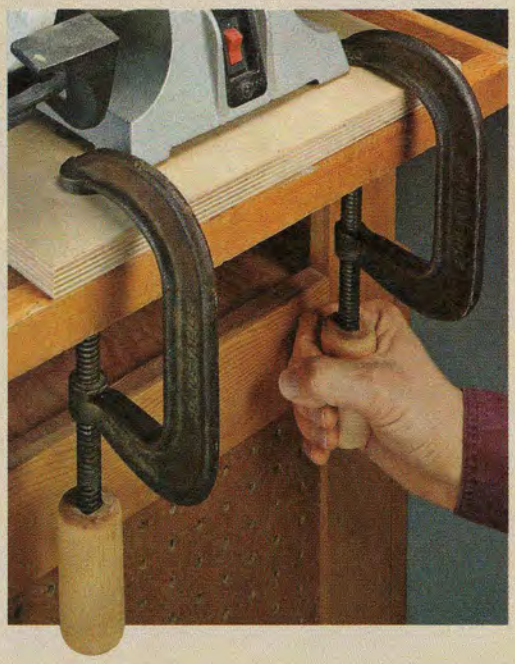


Taper Jig Setup

My *Wixey Digital Angle Gauge* works great for setting the blade angle on my table saw and miter saw. So when it came time to set the angle on my tapering jig, I thought I'd give it a try.

All you need to do is set the tapering jig on its side, as shown in the photo at right, and zero out the gauge. Then just lift the leg of the jig until the gauge reads the angle you need. Now lock in the setting and you're ready to cut.

Vito Palazzolo
Montvale, New Jersey



Hardwood C-Clamp Handles

There's no end to the uses for traditional C-clamps. But I was never happy with the thin cross handles that are the standard equipment for tightening them.

Fortunately, there's an easy way to make the clamps a little more user friendly. I start by cutting off the cross handle with a hack saw. Then I go to the lathe and turn a new handle out of hardwood scrap (a dowel would work well, too). Finally, drill a hole to match the diameter of the screw and glue on the new handle with epoxy.

Dennis Titchkosky
Winnipeg, Manitoba

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If you have an original shop tip, we would like to hear from you and consider publishing your tip in one or more of our publications. Go to:

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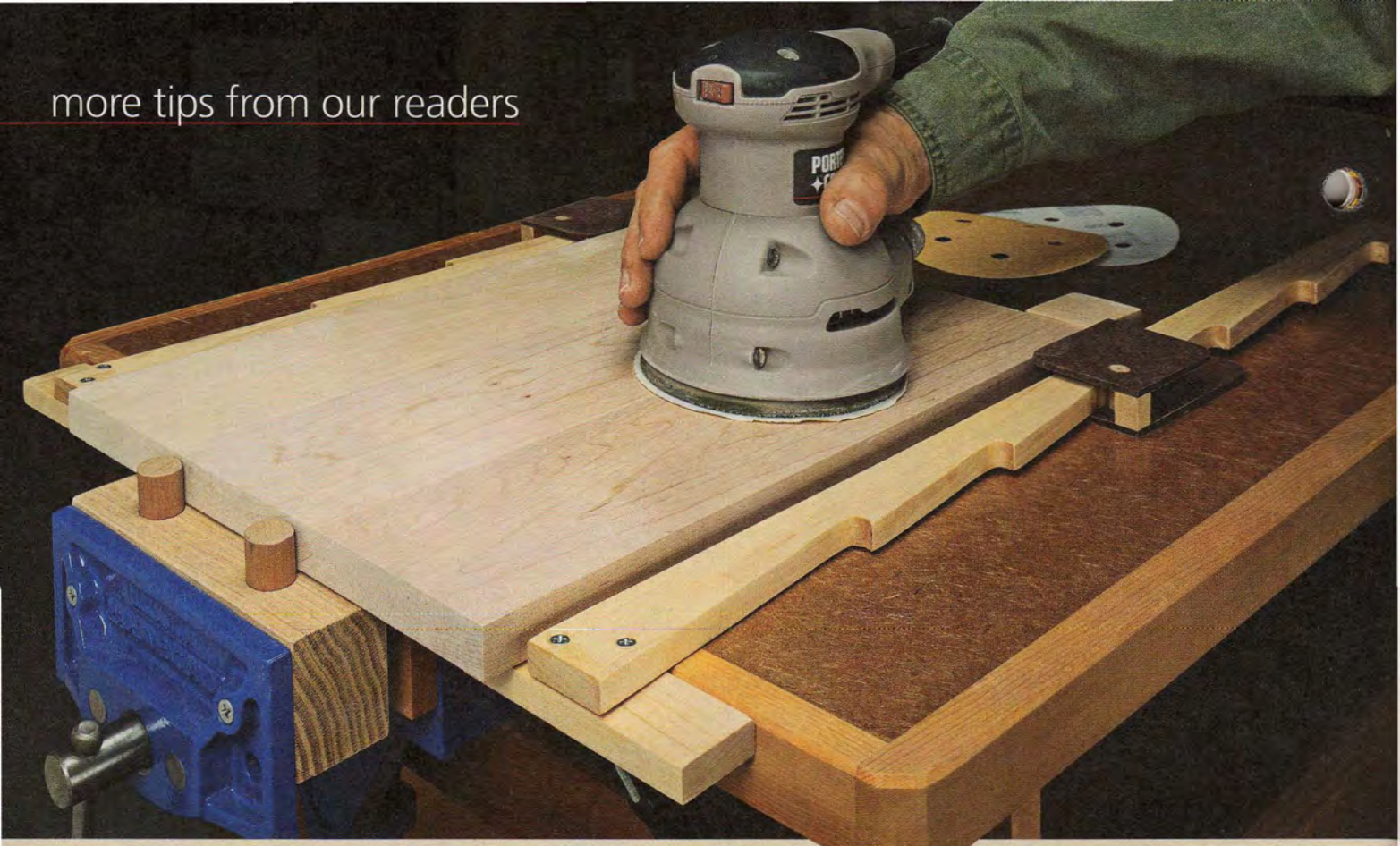


Bench Dog Alternative

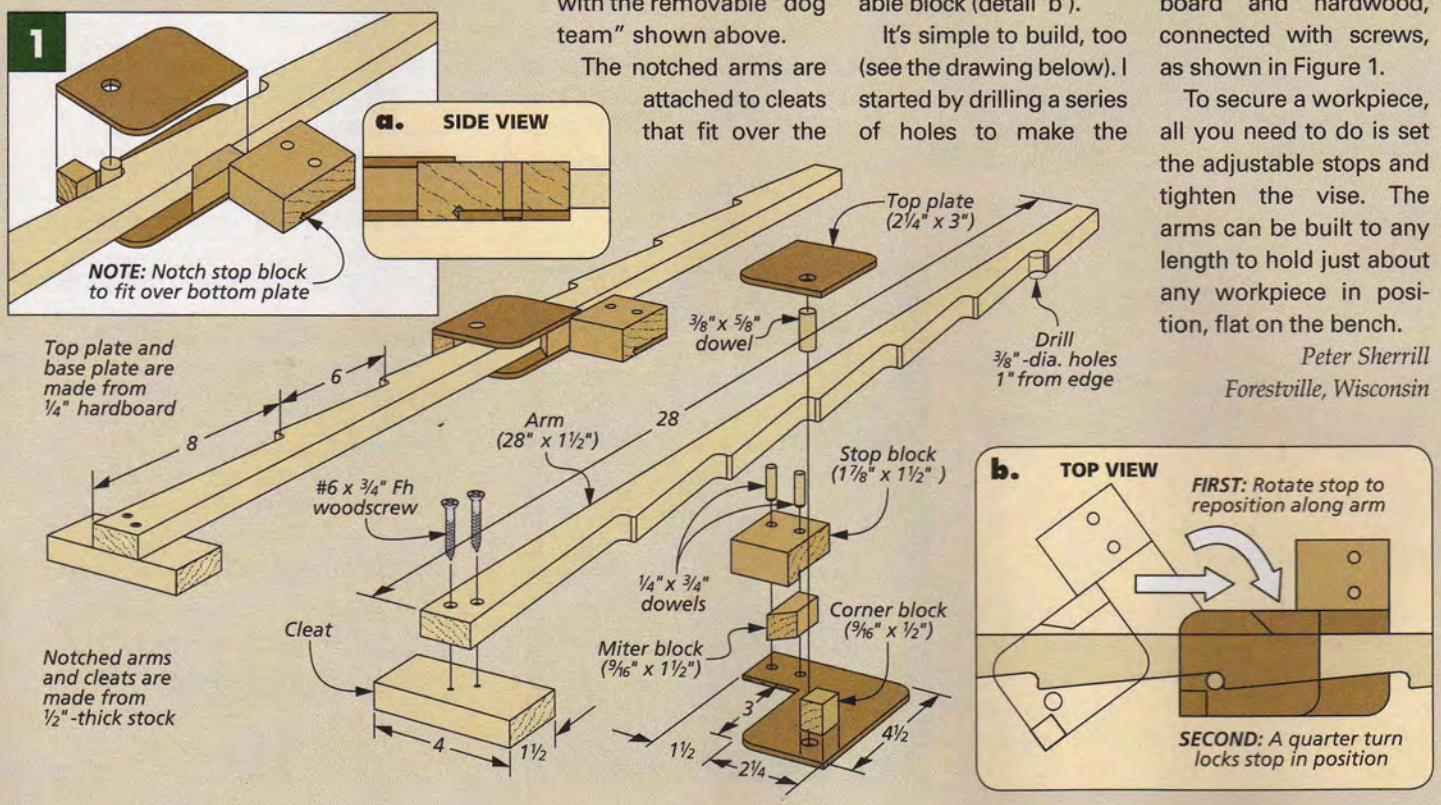
The surface of my workbench is just hardboard over a hollow-core door, so it's too thin to use with bench dogs. The thin layers of the hollow core door just won't support the dogs when under pressure. To get around this limitation, I came up with the removable "dog team" shown above.

The notched arms are attached to cleats that fit over the end of the bench. The notches allow you to move the stop blocks to any position with just a quick turn of the adjustable block (detail 'b').

It's simple to build, too (see the drawing below). I started by drilling a series of holes to make the notched arms. Then cut the arms to final shape at the band saw and fasten them to the cleat. The stop blocks are hardboard and hardwood, connected with screws, as shown in Figure 1.

To secure a workpiece, all you need to do is set the adjustable stops and tighten the vise. The arms can be built to any length to hold just about any workpiece in position, flat on the bench.

Peter Sherrill
Forestville, Wisconsin



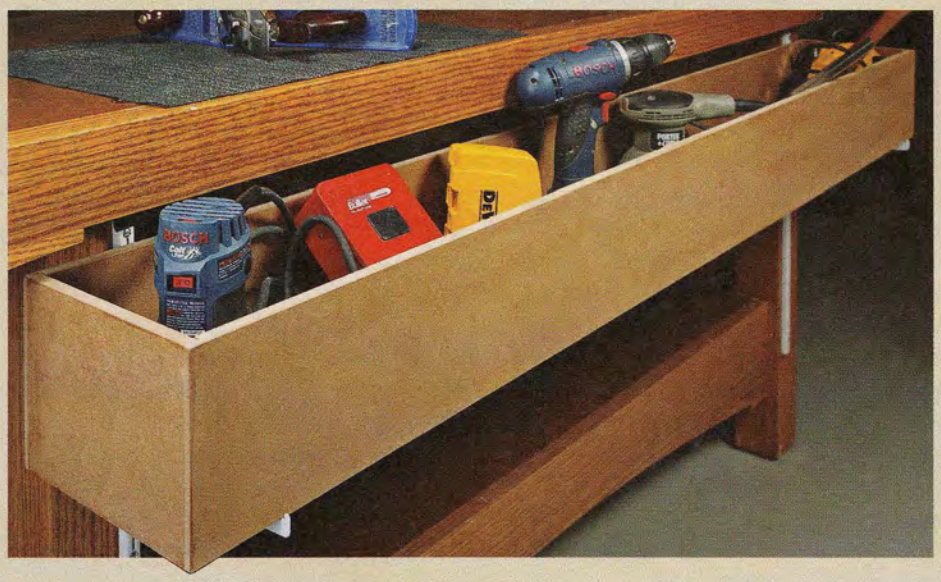
Workbench Shelf Brackets

I never really liked the idea of having a tool well on the top of my workbench. I just didn't want to lose the uninterrupted flat surface of the top. But having such handy storage near the bench seemed pretty tempting. I came up with a solution that offers the best of both worlds.

I found that attaching shelf standards and a few brackets to the legs of my bench provides an easy and inexpensive way to add storage capacity. Start by attaching a short length of shelf standard to each of the four legs of the bench. Then all you need to do is add shelf supports and you can make custom-built storage bins for your tools (as in the photo below). This gives you easily adjustable storage that you can place wherever you need.

To make the system even more useful, I turned a shelf bracket into a board jack by attaching a piece of hardwood to the top (photo above). With one end of the workpiece in the vise and the other resting on the support, I have an easy way to hold a board for edge planing.

Serge Duclos
Delson, Quebec



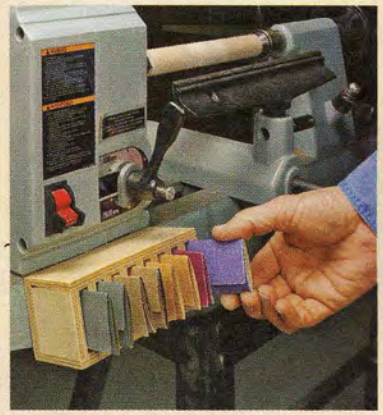
WIN THIS BOSCH *IMPACTOR* DRIVER

That's right, send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Bosch* impact driver just like the one shown here. To submit your tip or technique, just go online to *www.woodsmith.com* and click on the link, "SUBMIT A TIP." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Jeff Webster, winner of the *Bosch Impactor* driver. To find out how you could win a *Bosch* driver, check out the information on the left.

Quick Tips



LATHE SANDPAPER STORAGE

While sanding a project at the lathe one day, I got tired of digging through a pile of chips to find a piece of sandpaper. I built the sandpaper caddy shown above to make things a little more organized. To attach it to the lathe, I drilled shallow counterbores on the back and glued rare-earth magnets in place with epoxy.

Bruce Lewellyn
Westminster, California

SILICA GEL KEEPS BISCUITS DRY

Changes in humidity in the shop can really be a problem. It's especially troublesome for wood biscuits. I don't know how many I've had to throw out because they were too swollen to fit into a slot. I finally found a solution at a local craft store: silica gel desiccant. A couple of spoonfuls at the bottom of a jar is all it takes to keep the biscuits from "rising."

Percy White
Murphy, North Carolina

SANDBAGS AROUND THE SHOP

Some of my favorite "tools" in the shop are simple sandbags. I use them to weigh down small glue-ups and support odd-shaped pieces on the workbench. They also make great armrests for carving. To make one, fill a large resealable plastic bag with sand. If you know someone who can sew, cover it with denim from old jeans.

Jeff Acord
Belgrade, Montana

the benefits of Secondary Wood

How about a simple way to build a better project, with less effort, and at a lower cost? Sounds like a winning combination to me.

When I build a project (especially a case project), I'll often include more than one type of wood. The finished product is usually a combination of a primary "show" wood — cherry, oak, mahogany, or walnut — along with a much less noticeable secondary wood. Building with secondary woods has been common practice for hundreds of years and there are some very good reasons for it. It can improve the quality of the project while reducing the amount of labor and the cost.

WHAT IS SECONDARY WOOD? In choosing the primary wood for a project, appearance is usually the main consideration. But secondary wood can, more or less, go unseen. It's mainly used for the interior parts that may only show when the doors of a cabinet are opened or a drawer is pulled out.

This fact is a key to understanding the use of secondary wood. With a few exceptions, secondary wood is chosen for reasons other than color and figure. The best secondary woods are often the ones that wouldn't make the first team.

A SHORT LIST. Secondary woods are usually the ones we think of as being "plain." A short list might include poplar (tulip poplar), hard and soft maple, various types of pine, birch, sycamore, and red alder. But many types of wood can be used as a secondary wood to fill particular needs. Sometimes plywood or less desirable pieces of the primary wood can serve the role.

THE BENEFITS

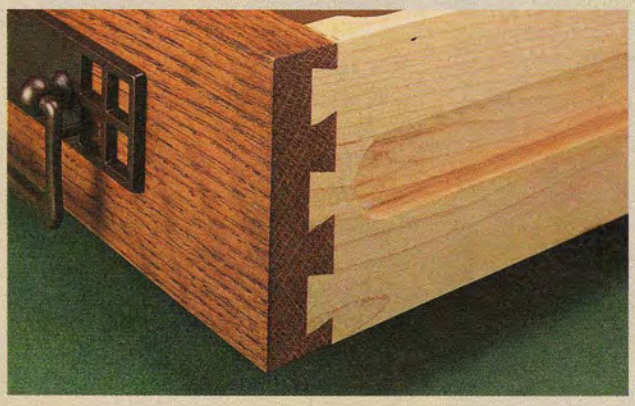
There are more advantages to including secondary wood in a project than you might think. One obvious plus is lower cost. Using a common, relatively inexpensive wood like pine or poplar in place of more costly walnut, mahogany or cherry naturally makes good sense. With ever-increasing lumber costs, any way to control material expenses without sacrificing quality is certainly welcome.

LESS EFFORT. Another good reason to use secondary woods is that they are usually easier to work with. A slightly softer, friendlier-working wood like poplar will serve just as well as a harder, more demanding piece of red oak. You can save yourself a lot of time and effort on the parts that don't show and spend it on the parts that do.

LIGHTER WEIGHT. Unfortunately, the attractive woods that woodworkers covet are also some of the heavier woods. This weight can complicate the construction and result in a hard-to-move project. Some wise use of secondary wood will go a long way toward solving the problem. A board foot of poplar or pine weighs about one third less than a board foot of red oak. This can make a big difference.

CONTRAST. Most woods achieve their second-class status due to plain figure, bland color, and an

▼ The maple sides contrast with the oak front to highlight the dovetail joinery.



often uninspiring appearance. But sometimes this can be an advantage. The finely fit dovetails on a drawer side wouldn't look nearly as impressive without the contrast between the darker primary wood and the light secondary wood. The lower photo on the opposite page illustrates this point.

A MASQUERADE. Sometimes you may want secondary wood to masquerade as the primary wood. The highly visible parts of the case — the front, and top — are made using the primary wood, while the sides are made of pine, poplar or birch stained to match the primary wood. This is commonly seen in antique period pieces.

MANY USES

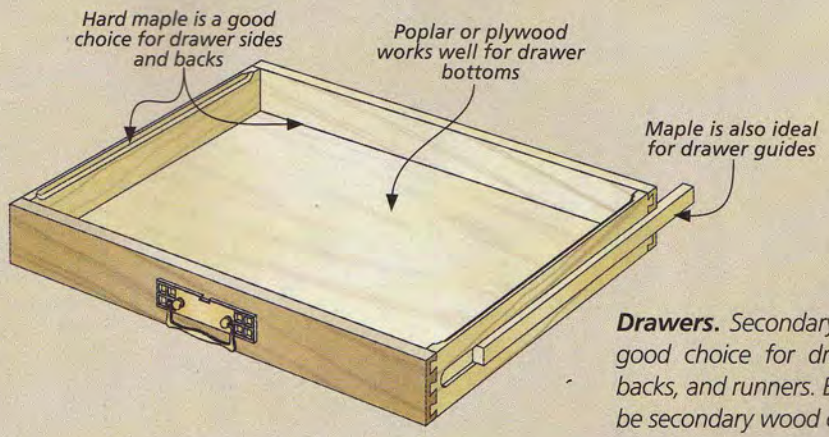
Secondary wood can fill in for the primary wood on a number of the parts in a project. Even though they're generally softer and lighter in weight, most are still tough enough to handle any structural requirements. The drawings at right illustrate some ideas.

DRAWER PARTS. On my projects, the drawer fronts are, of course, primary wood but the rest of the drawer parts are usually secondary wood. Although also used as a primary wood, long-wearing hard maple is a good choice for the sides and back. Plywood is a common option for drawer bottoms. Easy-to-work poplar is my first choice for solid wood bottoms.

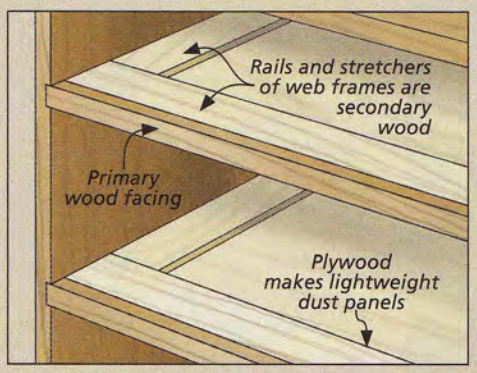
CASE DIVIDERS. The interior parts that divide a case can be made entirely from secondary wood. This includes web frames, dust panels, and also drawer runners and guides. Making these utilitarian parts from secondary wood is cheaper and easier.

CASE BACKS. The back of a case is another natural fit for secondary wood. In many instances, it will never be seen. So you can save yourself time and money by using plywood or making a solid-wood "board" back out of an inexpensive secondary wood.

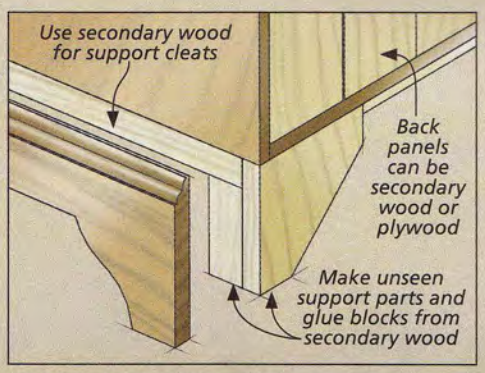
STRUCTURAL PARTS. Many cabinets have a variety of frames, cleats, and glue blocks that serve a vital structural role but don't show. They'll do the job just as well if you use secondary wood.



Drawers. *Secondary wood is a good choice for drawer sides, backs, and runners. Bottoms can be secondary wood or plywood.*



Web Frames. *It's common to use secondary wood for the rails and stretchers of web frames. The dust panels can be plywood.*



Hidden Parts. *Secondary wood works well for many of the unseen parts of a project. This includes glue blocks, cleats, and case backs.*

THE CHOICE

When it comes to selecting a secondary wood, you have lots of choices. It may just be a matter of what wood is most affordable and readily available. Most woodworkers develop a favorite after a time.

But some secondary woods have good specific uses. As I mentioned, I like to use hard maple for drawer sides and backs. It wears well and the color sets off the joinery. Birch and western alder can be used to mimic other woods. With the right stain, you have a good substitute for cherry, walnut, or mahogany.

My favorite all-around choice is poplar. It's can be found in clear, wide boards, is easy to work, and is relatively inexpensive.

So the secret to a better project might be including a cheaper, less attractive wood. I guarantee you'll find that it works. W

Versatile Sheet Stock

Plywood and MDF are both handy as secondary woods. The fact that they come in large panels makes them very useful, efficient materials. Second, you can avoid dealing with the problem of wood movement. Plywood is perfect for drawer bottoms, case backs, and dividers. MDF is a my substrate of choice for making veneered panels.

woodworking Drill Bits

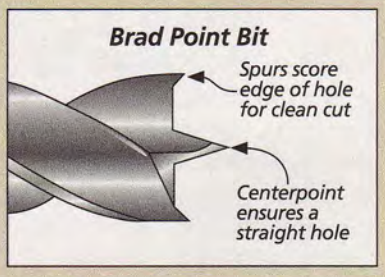
The secret to drilling cleaner, more accurate holes in wood is in selecting the proper bits.

Chances are that when you hear the words "drill bit" you automatically think of a standard, double-fluted twist bit. That's probably because they're inexpensive and can be found at any hardware store. But when it comes to drilling in wood, twist bits leave a lot to be desired. It's difficult to accurately start a hole in wood using one, and the bit has a tendency to wander.

The reason for this is twist bits are really designed for drilling holes in metal. Now, you wouldn't use a hack saw to cut wood. So why would you want to use a metal-drilling bit on wood? Fortunately for woodworkers, there are some better alternatives out there.

BRAD POINT BITS

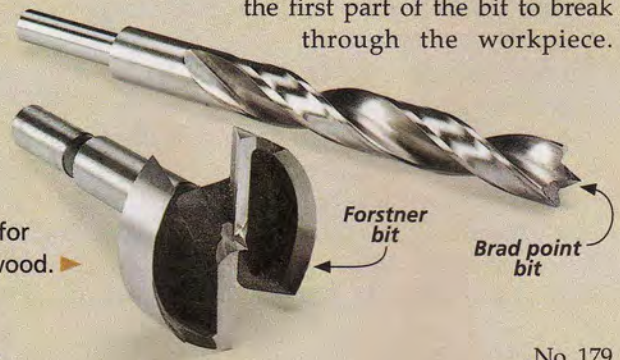
Most of the time, I use brad point bits for drilling in wood. At first glance, brad point bits look similar to twist bits. But they have some important differences. The first is that the flutes of the bit are usually ground at a steeper angle than on conventional twist bits. This helps to eject the wood chips faster and cuts down on the amount of heat buildup due to friction.



SPURS. But the main difference in brad point bits is at the business end. The tip has a long, sharp point in the center and two spurs at the outer edges of the bit. The point helps to position the bit and prevent it from wandering as it enters the wood. And the spurs score the wood fibers, leaving a clean hole.

TEAROUT. One of the downsides of brad point bits is that they have a tendency to splinter and tear out the underside of the wood as they exit the hole. The reason is the point isn't designed to actually cut.

Instead, it simply pushes its way through the wood. Since the point is longer than the spurs, it's the first part of the bit to break through the workpiece.



Forstner and brad point bits are both designed specifically for drilling in wood. ►

But as it's forced through the workpiece, it spreads the wood fibers apart, causing tearout.

The simplest solution to the problem of tearout is to place a backer board under your workpiece when drilling through holes. The backer board supports the workpiece and minimizes the amount of tearout as the bit exits the hole.

END GRAIN. Although brad point bits work great for drilling across grain, they don't work too well for drilling into end grain. The spurs of the bit have a tendency to grab and follow the grain of the wood, often causing the bit to wander.

If you do a lot of end grain drilling, you may want to invest in some specially-ground end grain bits. (See box below.) Or you can modify a standard brad point bit for end grain drilling by simply grinding down the spurs.

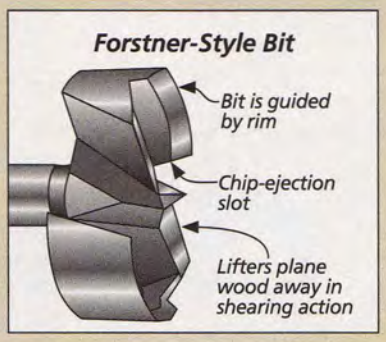
QUALITY. Not all brad point bits are created equal. Better quality bits are made of high speed steel instead of carbon steel, so they hold an edge longer. They'll also have cutting edges and centerpoints that are accurately ground to drill clean holes with minimal tearout. These bits cost a little more than typical "bargain" bits, but they're worth it. (For quality brad point bit sources, refer to page 51.)

FORSTNER BITS

While brad point bits handle the lion's share of drilling in my shop, they aren't the only bits I use. For certain drilling applications, I find a good set of Forstner bits to be indispensible.

RIM GUIDED. If you take a look at the drawing below, you'll see that that a Forstner bit is dramatically different than a brad point bit. A Forstner bit is guided by a solid rim, not by the centerpoint. The rim scores the edge of the hole, and then two chisel-like lifters plane the wood away in a shearing action. The result is a clean, flat-bottomed hole (photo at right).

Because of this, Forstner bits can be used to drill overlapping holes. This makes them great for drilling out the waste of a mortise, as shown in the photo above.



▲ Forstner bits excel at drilling overlapping holes without wandering.

Even though Forstner bits drill clean, accurate holes, they're not suitable for every application. For one thing, they don't cut very quickly. To avoid burning, you really need to run them at a slow speed. And because Forstner bits don't have much of a centerpoint to help guide them when starting a hole, they should be used in a drill press only — not with a handheld drill.

VARIATIONS. The original Forstner bit design is still the best when it comes to accuracy and quality of cut. But they're somewhat costly to produce. Fortunately, you'll also find other Forstner-style bits which are less expensive to manufacture and still deliver good results.

Forstner and brad point bits will handle the majority of your drilling tasks, but the bits below can also come in handy. W

▼ Smooth, flat-bottomed holes are the Forstner bit's specialty.

Specialty Wood Bits

Although brad point bits and Forstner bits will probably handle the needs of most woodworkers, there are some other options for special situations. A V-point bit works well for drilling angled holes. Because the bit doesn't have a centerpoint to pull it off target, it can enter the wood at an angle.

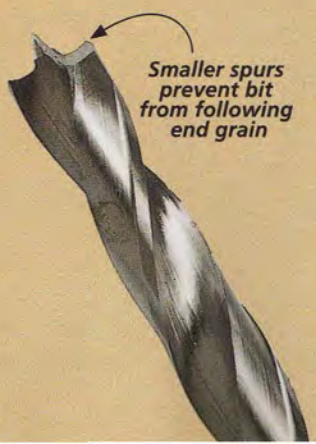
For repeated drilling in end grain, you can purchase a special end grain point bit. This is really just a modified brad point bit, with smaller spurs and a reduced cutting angle.

For rough work, where speed is more important than the quality of the finished hole, a set of spade bits comes in handy. These inexpensive bits can be found at most hardware stores.

▼ **V-Point Bit.** Because it lacks a centerpoint, a V-point bit can be used to drill angled holes.

▼ **End-Grain Bit.** Similar to a brad-point bit, an end-grain bit has smaller spurs and a slightly different cutting angle.

▼ **Spade Bit.** For less demanding tasks, spade bits are a good, inexpensive choice.



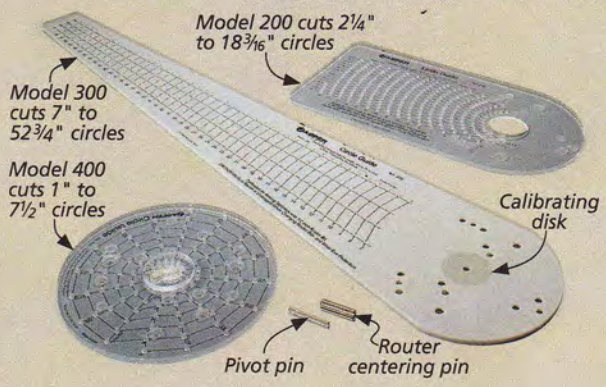
simple jigs for routing

Perfect Circles

Cutting circles with a router can be a snap with these handy circle jigs that mount quickly and easily to your router base.

▼ With these guides you can route circles from 1" to 52¾".

When it comes to cutting circles (or large holes), the router is my tool of choice. The router bit leaves a clean edge and very little sanding is needed after the cut. But in order to do this, you need a jig. And these three circle jigs by *Jasper Tools* make it all possible.



These jigs are acrylic templates with a series of holes for a pivot pin. All you need to do is attach one to the bottom of your router. (The jigs attach easily to your router using predrilled mounting holes.) Then insert the pivot pin in a hole drilled in the center of the workpiece and slip the jig over the pin. In almost no time at all, you'll have a cleanly cut circle.

But the best feature of these jigs is the incremental positioning holes that make sizing the circle a breeze. All you need to do to cut a perfectly sized circle is find the one hole that intersects with the whole and fractional numbers for the size of the circle you want. Just take a look at the example in the margin photo on the opposite page. For instance, if you want an 8½"-dia. circle, find the hole in the 8" column that intersects with the ½" row.

JIG SIZES. There are three jigs for cutting different sized holes. (Sold in sets or individually.) Choosing the right one depends on the size circle you plan to cut. While it's possible to cut small circles with the large jig, it can be cumbersome. The jigs range in price from about $20 to $60. More information is in Sources on page 51.

USING THE JIG

Before you start cutting any circles, you'll need to take a moment to set up your router. The first step is to center the bit in the jig.

To do this, you use the calibrating disk and ¼"-dia. centering pin (left photo below). First, insert the pin in the router's collet. This will help you align the center of the jig with the center of the router. Then guide the jig, with the calibrating disk in place, over the steel pin. All that's left is to rotate your router on the jig until the mounting holes line up and attach it with screws. Once the jig is mounted, you can remove the disk and pin. But save it for future installations.

CHOOSING A ROUTER. These jigs are best used with a plunge router. With a plunge router, you can set the maximum depth of the bit and then just lower the router for multiple passes around the opening. I set the router to cut a ¼" deep groove with each pass. Depending on the thickness of the workpiece you're cutting, you may need to make several passes.

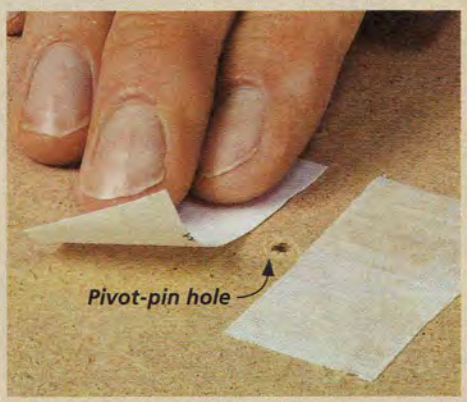
CHOOSING A ROUTER BIT. The *Jasper Circle Jigs* are calibrated for use with a ¼"-dia. router bit. I chose to use a spiral upcut bit to bring the debris up out of the cut. But a straight bit or a downcut bit will work just as well. You can also use a larger bit for faster cuts. Adjustments for different router bit sizes are included with the instructions.

SECURE THE WORKPIECE. There are a few things to keep in mind before you get started. It's important to secure the workpiece before you start routing. I attach the workpiece to the top of a scrap piece with double-sided tape. This way you'll save your workbench top when the bit cuts through. Tape both inside and outside the cutting line so that the workpiece is secure as you cut it free from the waste.

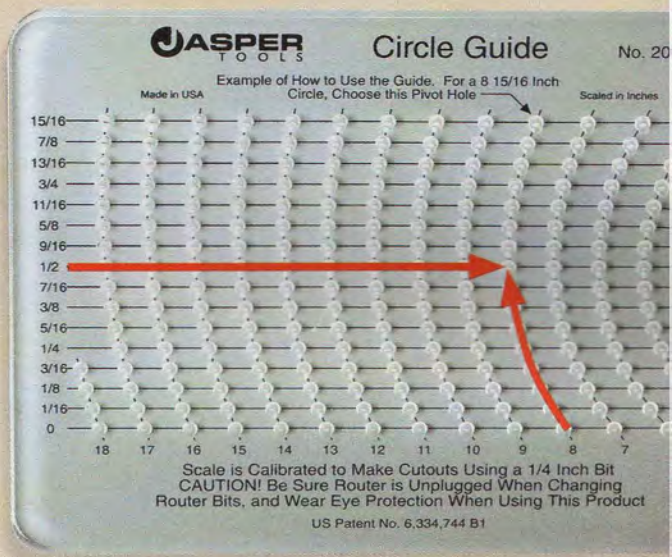
CENTERING PIN. The next thing to do is drill a hole in the center of the workpiece for placement of the pivot pin. This is just a ⅛" pin that goes through the jig and into the center of the workpiece. It guides the router in a perfect circle.

CUTTING DISKS. The jigs are calibrated for cutting holes. But you can cut disks as well. You'll just need to add ½" to the scale. For instance, if you want to make a 6" disk, you'd place the pin a half inch over at the 6 ½" mark.

With these jigs you'll be cutting circles in no time for clocks, speakers, toys, tabletops or just about anything that's round or arced. You could even put a profile bit in your router and cut a profile on the edge of a table with the large jig. W



▲ Secure the workpiece to a solid surface with double-sided tape near the pivot-pin hole and at the edge.



▼ To rout an 8½"-dia. hole, position the pivot pin at the intersection of the 8" and the ½" lines.

How-To: Rout Circles with the Jasper Jigs

▲ **Mount the Jig.** Using the included locating pin and calibrating disk, mount the jig on the router.

▲ **Locate the Pivot Pin.** Drill a ⅛"-dia. hole in the workpiece. Then insert the pin in the proper hole in the jig.

▲ **Rout the Circle.** Position the pin in the centered hole, plunge the router, and complete the circle.

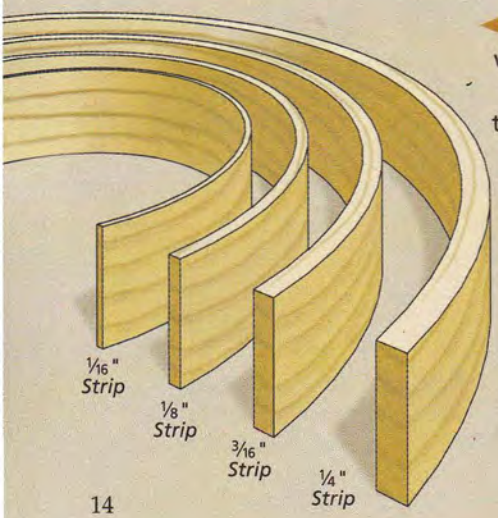
easy, step-by-step Bent Lamination

Adding graceful curves to a project can really make it stand out. An easy way to do this is a process called bent lamination. It involves bending thin strips of wood in a form to create a curve, like the handle on the tote on page 16. Once you know the secrets, you can add elegant curves to your projects.

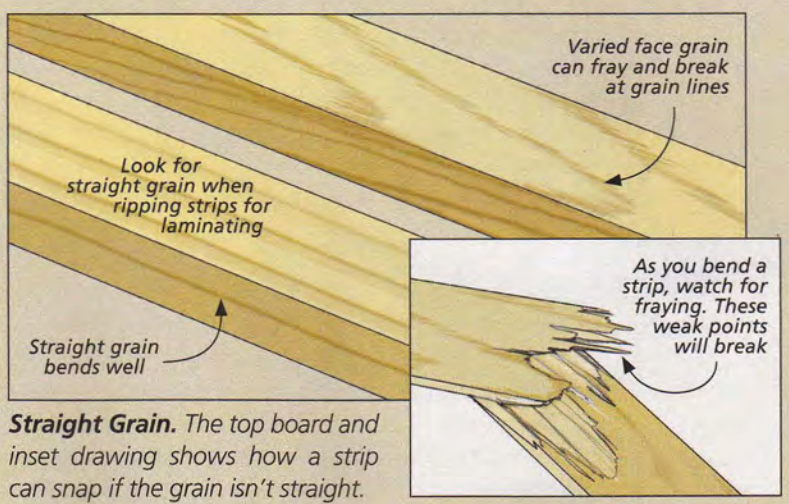
Bent lamination is just a process of ripping wood into thin strips and then gluing it back together as it's wrapped around a bending form. Clamps hold the strips until the glue dries. But there are a few thing to consider when incorporating this process into your projects.

WOOD SELECTION. The first thing to think about is the type of wood. Not all species of wood can be bent successfully. Brittle wood such as maple, doesn't bend as well as oak, cherry, or ash.

GRAIN DIRECTION. Once you've decided on a type of wood to use, the next thing to look at is the



◄ Thinner strips will bend more easily around tighter corners.



Straight Grain. *The top board and inset drawing shows how a strip can snap if the grain isn't straight.*

grain direction. What I mean is you should look for lumber with straight grain on the edge of the board. This will allow you to cut strips from the edge so the wood fibers lay flat when you bend it.

THICKNESS. As you can imagine, when bending wood, the thickness of the strips comes into play. In most cases, I find that a thickness of about ⅛" works well. But bend a test strip. If it starts to break, rip the strips thinner. You'll find more information about thin strips in the article on page 40.

BENDING JIG

One key to successful bent lamination is the design of the bending jig or form. For simple curves, I use a form that works like a press.

HEIGHT. Pressure needs to be applied evenly around the entire form to avoid gaps between the strips. For this reason, I make the form as tall as the wood strips. In the case of the handle for the box the forms should be 1" high.

SHAPE. The shape of the form comes into play too. You can establish the curved shape of the inner form from the measurements of the finished workpiece (in this case, the size of the handle). But for the outer form, you'll need to add the thickness of the strips. I just measure and mark the distance with a compass. Finally, you'll need to sand the edges of the form so that no irregularities are transferred to the laminated workpiece.

PRESSURE BLOCKS. The outside form may look ready for use. But if you cut it into separate pressure blocks (third photo on right), you'll have room to move the forms. This will help close up any gaps that crop up during the glue up.

CLAMP POSITIONS. Bending wood requires a lot of pressure so you'll want to use a lot of clamps. I locate the holes for the clamps as close together as possible to maximize the number of clamps I can use.

WAX THE FORMS. Before applying glue and setting the laminations in place, it's a good idea to wax the forms to prevent glue from sticking to the forms. It will also keep water from damaging the forms if you decide to pre-bend.

THE PROCESS

There's a process I use to put everything together. It's not difficult, but you'll want to do a little planning and have all your glue and clamps on hand before you start.

PRE-BENDING. If you're bending wood into a gentle curve, you can go straight to the glueup from here. But for tight curves, it's a good idea to "pre-bend" the strips by soaking them in water and clamping them briefly in the jig before gluing them up.

I start by soaking the strips. Then you can stack the strips together and lay them on edge, as shown in the main photo. I mark and match the center of the form to the center of the strips and clamp the center first. Then I work my way around to the ends. This way the clamps hold the strips in place while they are bent around the form.

GLUE UP. Once the strips are dry, you can remove them from the jig for glueup. I generally use yellow glue, but plastic resin adhesive or polyurethane glue work well too. I like to use an old credit card to spread the glue. It creates an even film of glue. Just be sure to cover the strips to the edges. Then you can place the strips in the jig and clamp them. Just follow the same steps as in the pre-bending section.

It's a good idea to let the glue dry for at least 24 hours before you remove the wood from the clamping jig. Remember, the strips are thin, they're saturated with glue, and clamped into a tight space, so the glue will dry slowly.

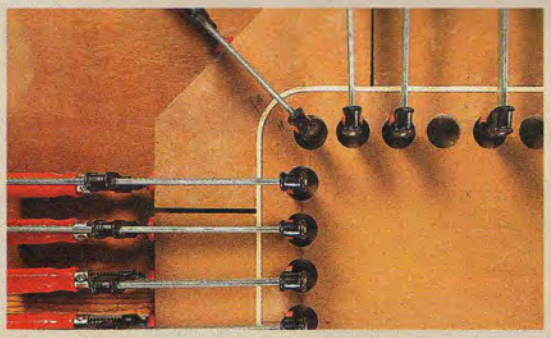
FINAL CLEAN UP. After the glue dries, all you need to do is remove the excess glue and trim the piece to final width and length. A scraper or putty knife will take a lot of the glue off before you start sanding. Then you can trim the length.

Laminating wood isn't as difficult as it might look. And the design options it gives your projects makes it a worthwhile skill to learn. W

Shop Tips: Glueup

Apply Wax. *Applying a coat of parafin wax to the bending form will protect the form from water. It will also keep the glue from sticking to it.*

Complete Coverage. *Ample amounts of glue should be spread to the edges of the strips. An old credit card makes a good glue spreader.*



Clamps. *You can never have too many clamps when gluing up laminations. So drill the clamping holes close together on the form.*

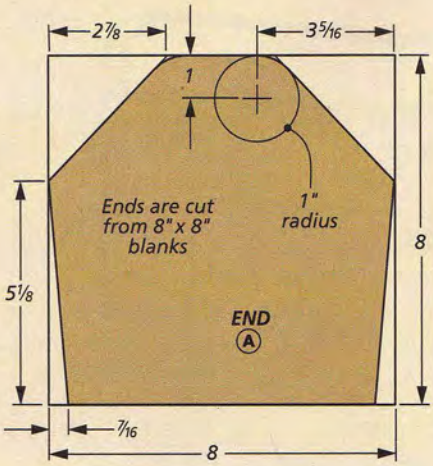
Tight Fit. *A narrow block and a hammer will ensure that the laminations are seated in the bottom of the clamping form for a uniform glue-up.*

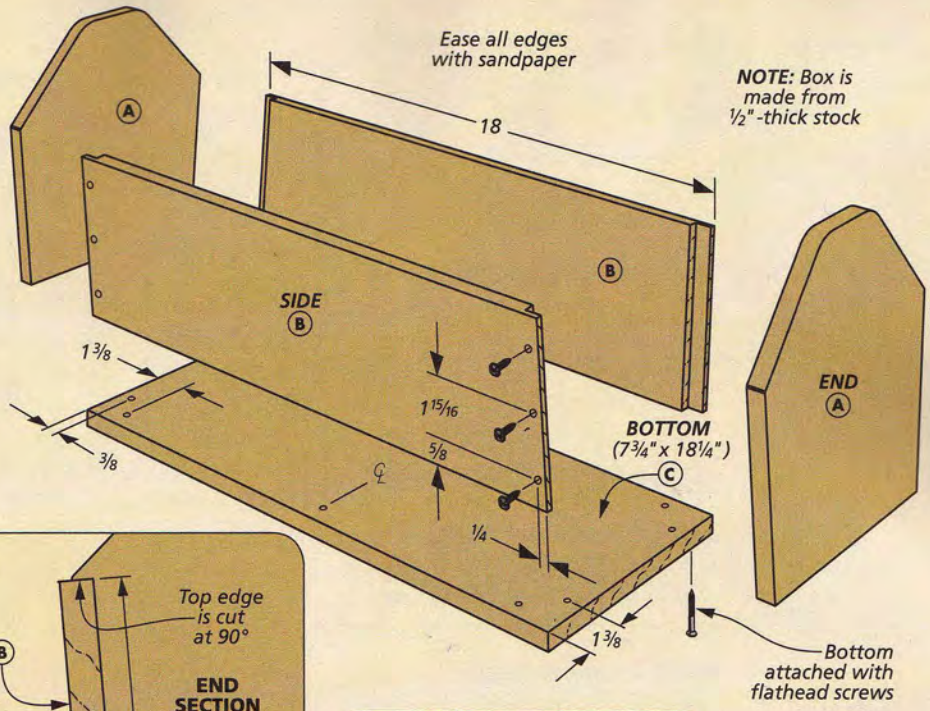
slant-sided Pine Tote

This easy-to-assemble tote goes together quickly. And the bent wood handle offers a chance to try a new technique.

Boxes are always great projects. But add a handle to a box and you have a tote that can be used in a variety of ways, from a handy supply caddy for crafts to a picnic basket to a gift box filled with goodies. With this many uses and the simple construction, you may want to make more than one.

The box is just four sides and a bottom joined with rabbets and screws. The real challenge is making the handle. It uses a bent lamination technique that incorporates a shop-made jig and thin strips of wood. The result is a handle with a smooth, graceful curve that will surely be noticed.



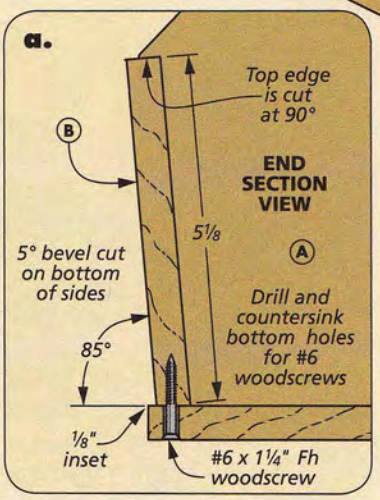


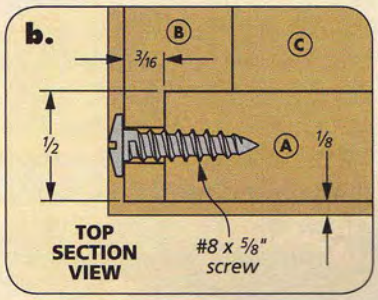
making the Box

I started by making the box and then later shaping the handle to fit. As you can see in the drawing at right, it's just a basic box made from ½"-thick stock. The sides are joined to the ends with rabbets. And the ends of the box are tapered so the sides splay outward. Rounded corners soften the top edge.

ENDS. Since the ends are identical, I taped the blanks together to shape them. This way, you can cut the tapers and sand the radiused corners on both pieces at once, as shown in the How-To box below.

SIDES. There's not much to making the sides. I started by cutting a couple of blanks to length, but left them a hair wider than necessary. After rabbeting the ends of both pieces at the table saw, you can rip the pieces to width by cutting a bevel on the bottom edge of each side to match the taper on the end of the tote (detail 'a').





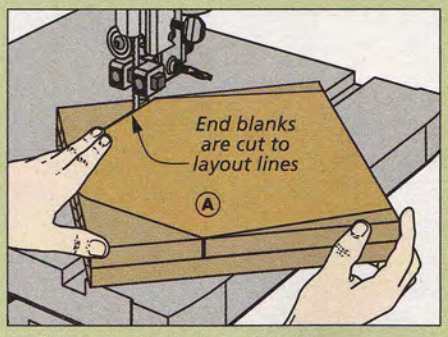
ASSEMBLY. At this point, you can attach the sides to the ends with glue and screws. I used rustic, black iron screws to enhance the aged appearance of the tote (see photo in margin at right). Just center them on the thickness of the end pieces (detail 'b').

BOTTOM. With the sides and ends assembled, you can now make the bottom. I sized the bottom slightly larger than the footprint of the box. This creates an interesting lip around the tote, and makes fitting the bottom to the box a bit easier.

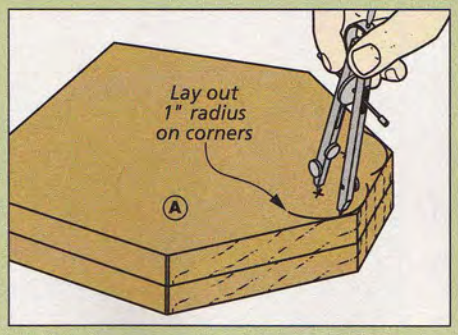
After drilling some countersunk screw holes in the bottom, you can attach it to the box with flathead screws, as shown in detail 'a.'

▲ Black iron pyramid head screws give the tote an antique look.

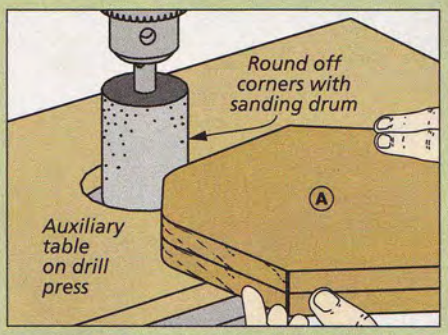
How-To: Shape the Ends



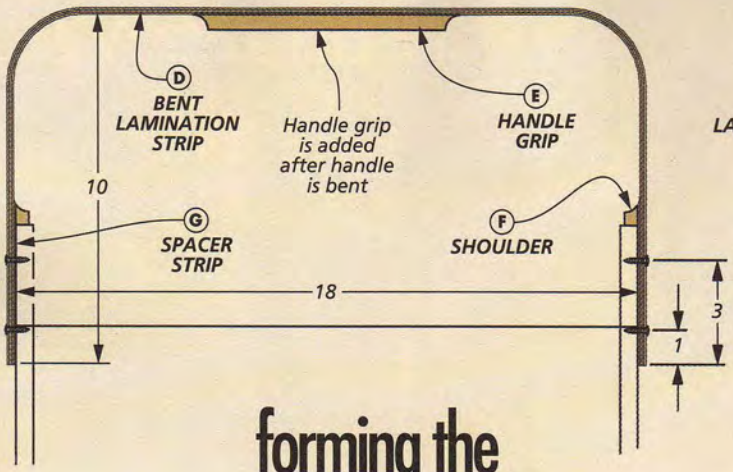
Cut the Tapers. *The tapers on the ends can be cut on the band saw. Tape the two blanks together to cut identical parts.*

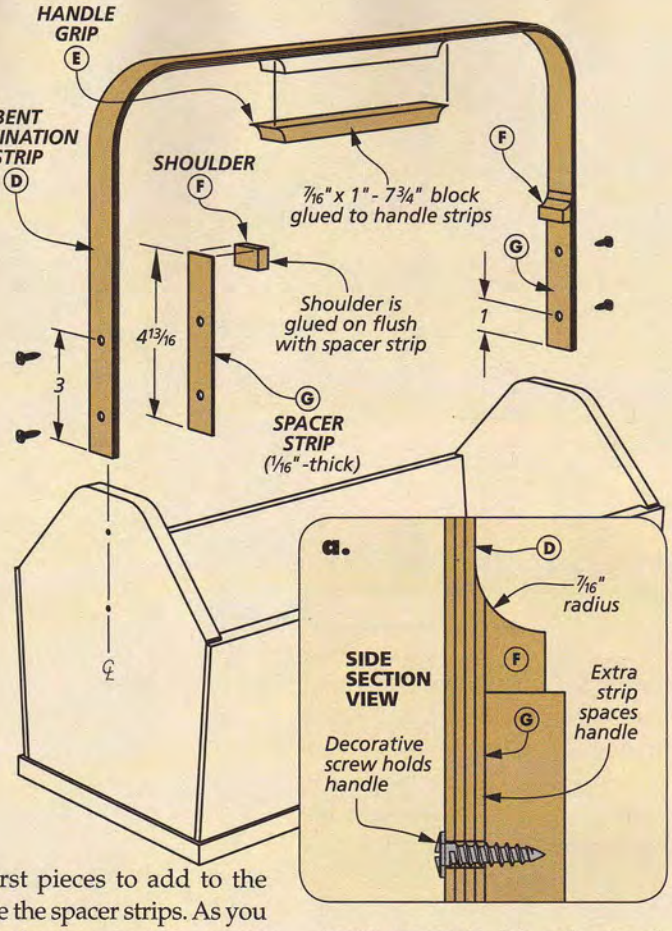


Radius. *After sanding the tapers smooth, use a compass to lay out the rounded corners at the top of the end pieces.*



Sand it Smooth. *A sanding drum on the drill press makes quick work of rounding off the corners of the end pieces.*





forming the Handle

▲ An aged paint finish on this tote creates a different look. For details, see page 28.

Once the box is complete, you can turn your attention to the bent lamination handle. I added some functional features to it, including a hand grip at the top of the handle and a shoulder at the box top.

BENT LAMINATION. Bent lamination requires a little extra effort, but the rewards are big. Projects with bent wood almost always get a closer look. And this handle is no exception. For an in-depth look at the technique I used, refer to the article on page 14. There's also specific information about completing the handle in the How-To box below and on the opposite page.

COMPLETE THE HANDLE. Once you have the bent portion of the handle shaped and cut to size, you can add the hand grip, spacer strip, and shoulder pieces.

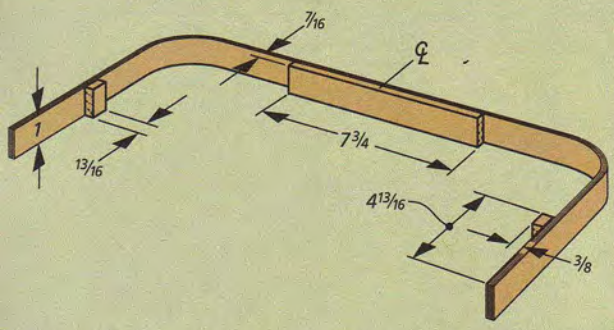
The first pieces to add to the handle are the spacer strips. As you can see in the drawing above and detail 'a,' these are just a couple thin strips that are glued to the inside face of the ends of the handle. They give the handle some extra thickness and support for the screws that attach it to the box.

The handle grip and shoulders start out as small blocks of wood cut to size. After gluing them in place, I cut coves in the ends with a coping saw (see the How-To box below). Finally, you can sand the coves smooth with a sanding drum.

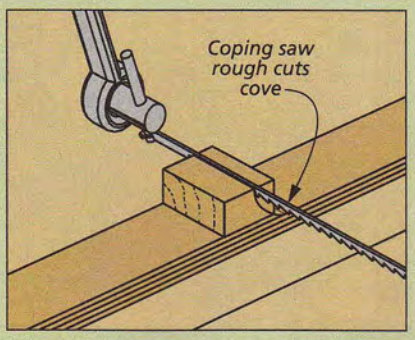
ATTACH THE HANDLE. After the shoulders and grip are in place, you can screw the handle to the box (detail 'a'). I predrilled the holes for the screws at the points shown in the main drawing above.

FINISH. I used orange shellac to finish the tote and give it a warm look. But since I already had the jig made for bending the handle, I made a second tote with a painted finish. No matter which finish you choose, you'll have a project that's both attractive and functional. W

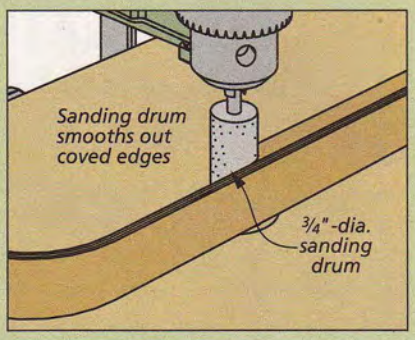
How-To: Handle Details



Adding the Details. *The handle grip, spacer strip, and shoulders are added to the handle once it's cleaned up and sanded smooth.*

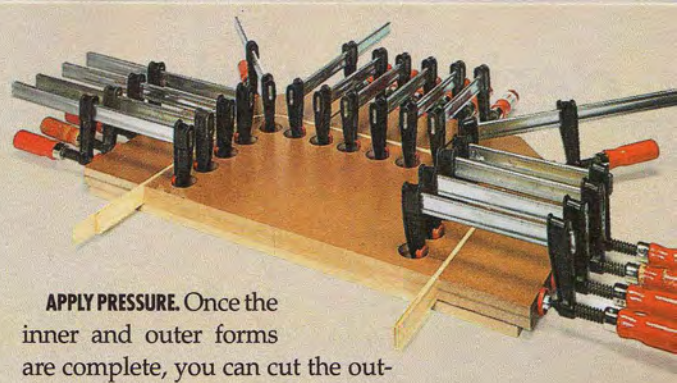


Cutting the Curve. *Use a coping saw to make the cove cut on the shoulders and the handle grip.*



Sanding Smooth. *Use a small diameter sanding drum to match the cove cut in the shoulders and handle grip.*

How-To: Building a Bending Jig



▲ Let the handle dry in the form overnight before removing the clamps.

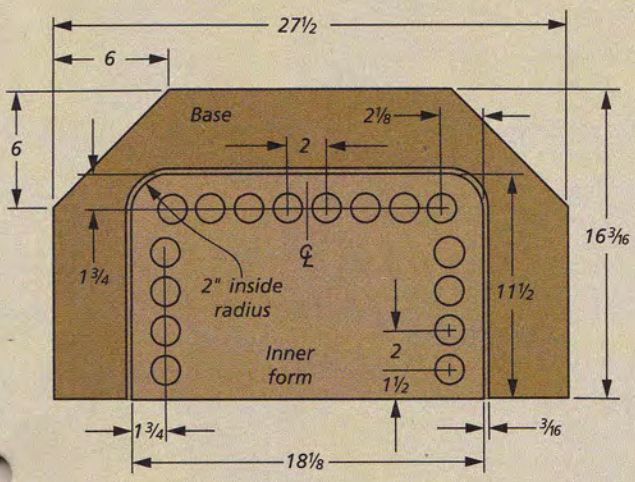
To make the curved handle for this box, I used the bending jig you see below. It consists of inner and outer forms that clamp the strips tightly as they are glued (photo at right).

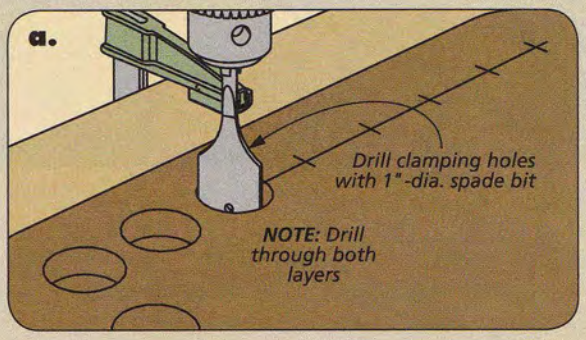
SHAPE. The shape of the form is important for clamping to be effective. You can establish the curved shape of the inner form by the finished measurement of the handle (drawing below). But for the outer form you'll need to add the thickness of the handle (3/16") to the measurement (upper left drawing). This way, you'll create a gap in the form to hold the strips.

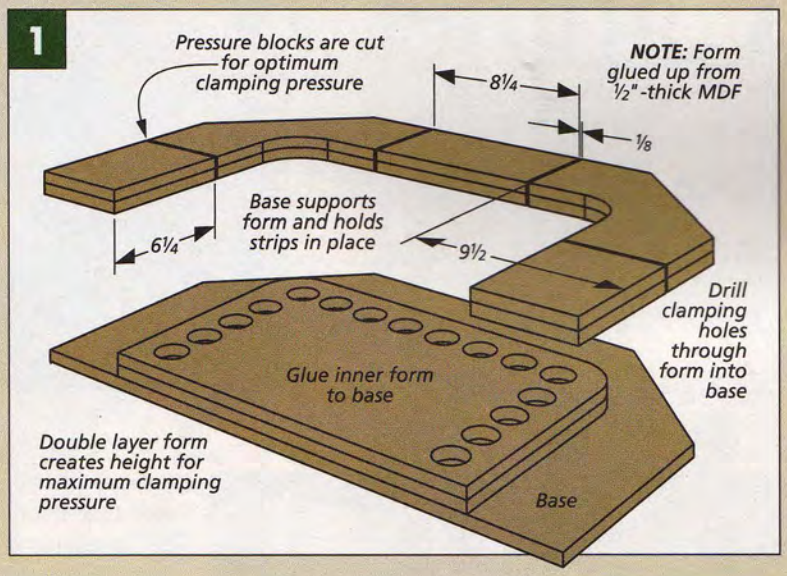
FORM DEPTH. It's important to apply pressure evenly around the entire form to avoid gaps during glue up. For this reason, I made the form 1" high and spaced clamps every 2" around the inner form.

APPLY PRESSURE. Once the inner and outer forms are complete, you can cut the outside form into sections for separate pressure blocks, as shown in Figure 1. The clamps will be positioned around the perimeter of the inner form. I drilled three clamp holes at each bend and the sides, with four across the top (detail 'a'). This way the forms will apply even pressure around the entire handle.

For more information on cutting the thin strips for bent lamination, refer to the article on page 40. This article will guide you step by step to consistent thin strips.





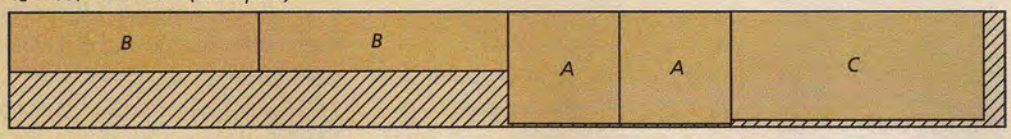


Materials, Supplies & Cutting Diagram

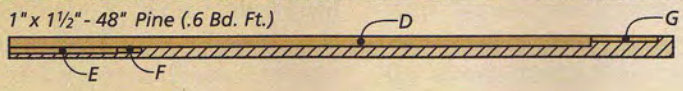
A	Ends (2)	½ x 8 - 8
B	Sides (2)	½ x 5⅛ - 18
C	Bottom (1)	½ x 7¾ - 18¼
D	Bent Lamination Strips (3)	1/16 x 1 - 42
E	Handle Grip (1)	7/16 x 1- 7¾
F	Shoulders (2)	⅜ x 1 - 13/16
G	Spacer Strips (2)	1/16 x 1 - 4 13/16

- (10) #6 x 1¼" Fh Woodscrews
- (16) #6 x ⅝" Black Iron Pyramid Head Screws

½" x 8¼" - 72" Pine (4.1 Sq. Ft.)



1" x 1½" - 48" Pine (.6 Bd. Ft.)



file Storage Cabinet

Spice up the storage in your home or office with this decoratively designed file cabinet.

▲ **Practical Design, Stylish Execution.** Hiding behind the false fronts are full-size file drawers, big enough to handle your storage needs.

Several years ago, "experts" were talking about how computers and the internet would soon have us all living in a paperless environment. I don't know what happened to that notion, but I'm pretty sure I'm accumulating as much paper today as I ever did. And to keep it all organized, I rely on file cabinets.

The good news is, file cabinets don't have to be the unattractive metal or fiberboard boxes found in office supply warehouses. You can build your own to suit the decor in any room of your home.

The cabinet shown above is a good example. It's designed to give the appearance of the small drawers of an old-fashioned library card catalog, but it actually holds full-size file drawers. And if you like the look but don't need file storage, you'll find another option in Designer's Notebook on page 27.

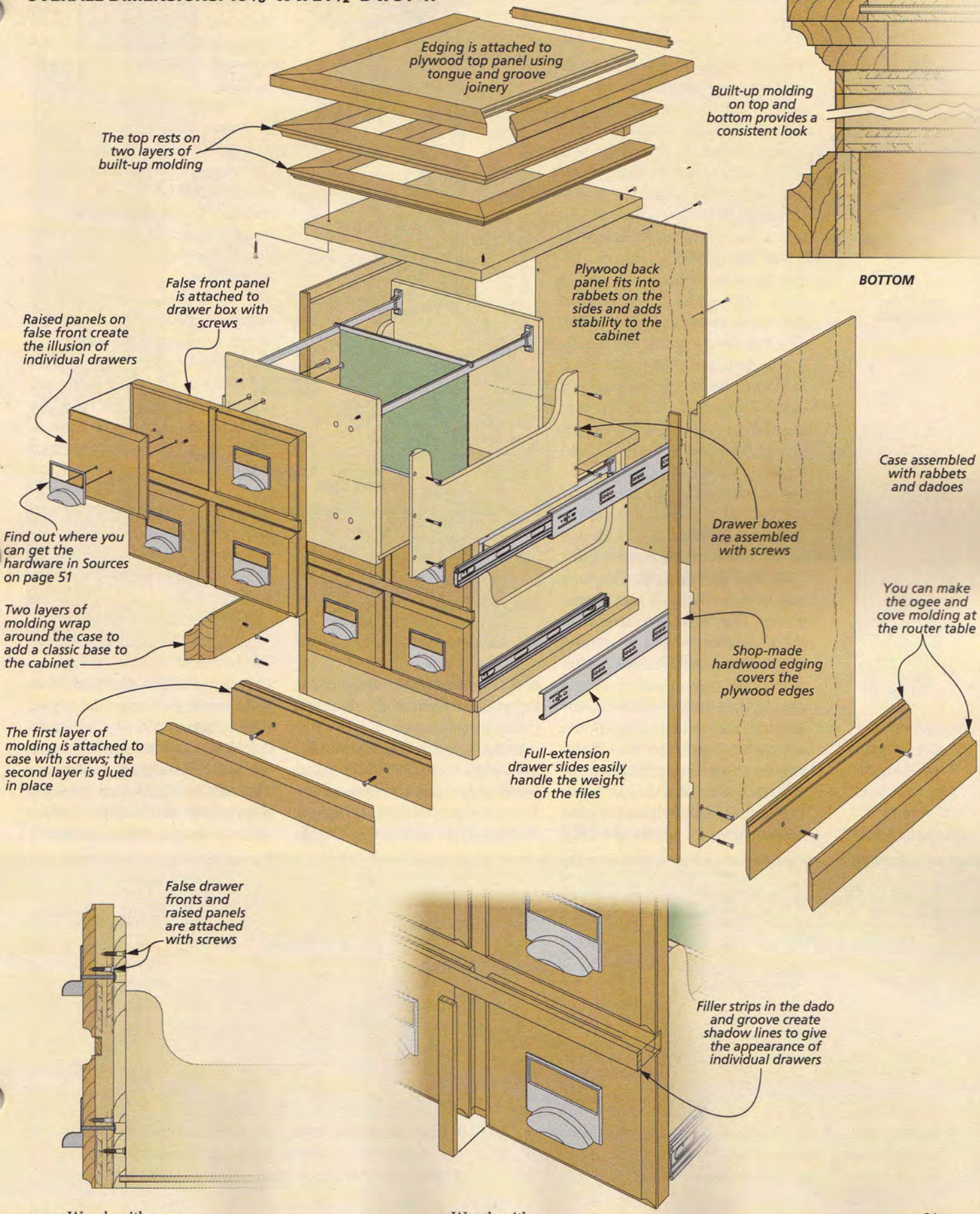
I created the card catalog effect by adding false hardwood fronts to a plywood front panel. It's not hard to do and the result is well worth the effort.

Another attractive feature is the built-up molding. In addition to giving the piece a traditional look, it's easy to make. I shaped the molding at the router table using a couple of common, inexpensive router bits. Chances are you already own the ones you'll need.

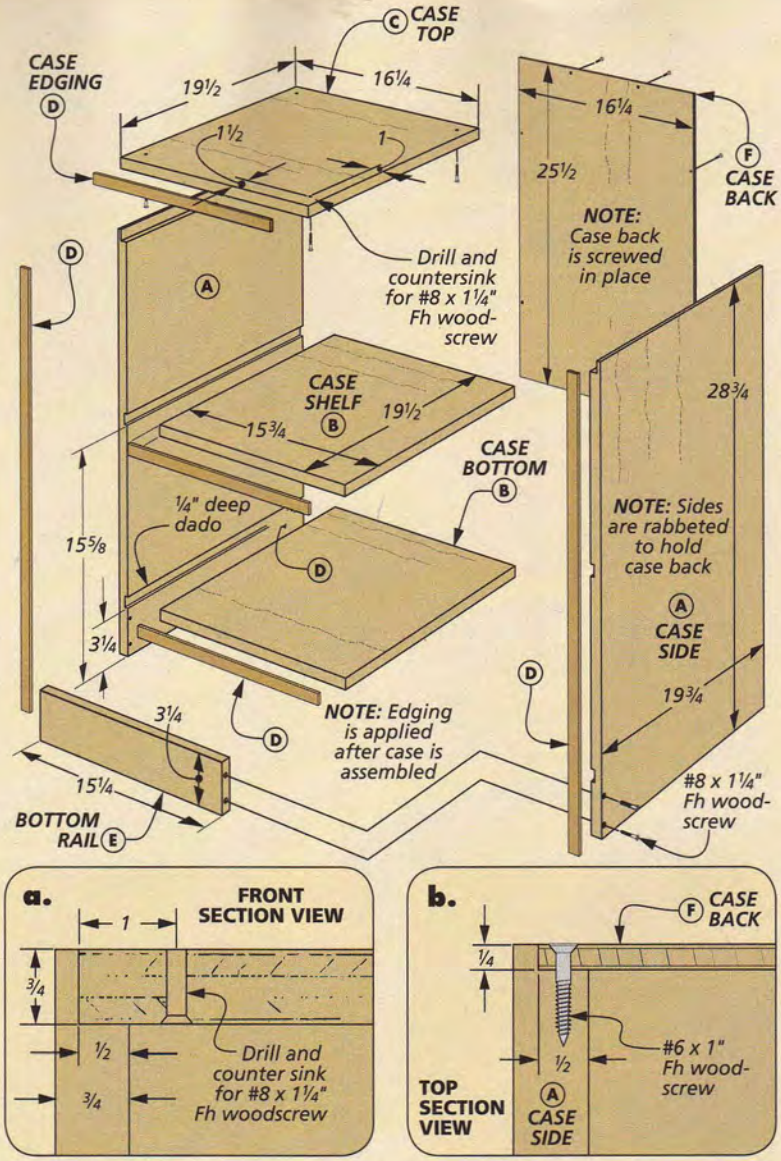
To make sure the drawers could handle the weight of the files, I chose heavy-duty, full-extension drawer slides. Card frame drawer pulls complete the look.

CONSTRUCTION DETAILS

OVERALL DIMENSIONS: 19⅞"W x 21½"D x 31"H



a sturdy CASE



The cabinet needs a solid case to hold the weight of the files, so that's where I started. It's really just a plywood box divided into two drawer compartments. I chose dado and rabbet joinery for the case. When used with plywood, it's very stable and strong. The plywood back reinforces the strength of the cabinet.

START WITH THE SIDES. I began by cutting the sides to size. Then, with a dado blade in the table saw, I cut the rabbet at the top of each side. The box below gives the details for the dado and rabbet cuts. Then cut the rabbet on the back of both sides. This will hold the ¼" plywood back panel. Now you can cut the two dadoes that will hold the middle shelf and the bottom.

The last thing to do is drill and countersink screw holes near the front edge of both sides. These will be used to attach the bottom rail.

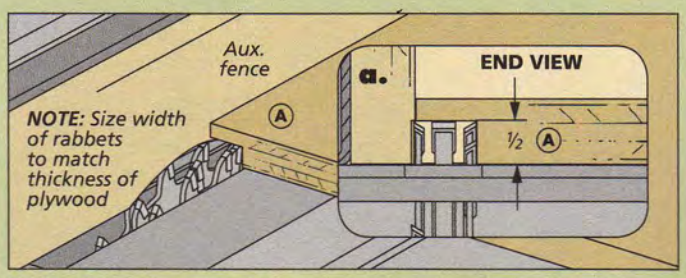
THE SHELF, BOTTOM, & TOP. The next step is to cut the shelf and bottom to size. They're ¼" narrower than the width of the sides to account for the thickness of the back. After cutting the top to size, drill and countersink screw holes at the locations shown in the main drawing above. You'll use these holes later to attach the top molding.

ASSEMBLE THE CASE. At this point, you're ready to assemble the case. You can start by gluing the shelf and bottom in place. Then fit the top in the rabbets on the sides and clamp the assembly.

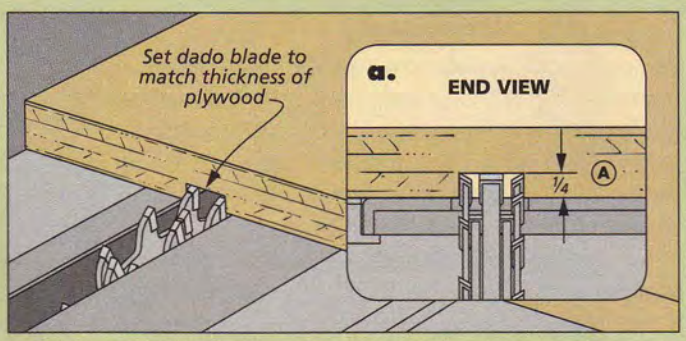
EDGING. To cover the edges of the plywood, I used ¼"-thick hardwood strips. It's a simple matter to rip the strips at the table saw. You'll find it works best to glue the edging to the sides first. Then you can cut the horizontal edging to fit in between.

BOTTOM RAIL. The hardwood bottom rail lends rigidity to the case. The rail fits flush with the front edging and attaches with screws in the holes you drilled earlier.

How-To: Rabbets and Dadoes



Rabbet for the Top. *With a dado blade installed in the table saw and an auxiliary fence attached to the rip fence, you can cut the rabbet for the top panel in one pass.*



Dadoes for the Shelf and Bottom. *After lining up the cut for the bottom, cut both side pieces using the same setting. Then set the fence for the dado that will hold the shelf.*

ATTACH THE BACK. The ¼"-thick plywood back completes the case. After cutting it to size, fit it into the rabbet and attach it with screws.

THE BOTTOM MOLDING

The matching molding at the top and bottom of the cabinet gives it a distinctive look. It's simply two layers of hardwood cut at different widths to provide a built-up effect. Each layer is mitered to wrap around the case. You can make all the molding at the router table, using just two router bits.

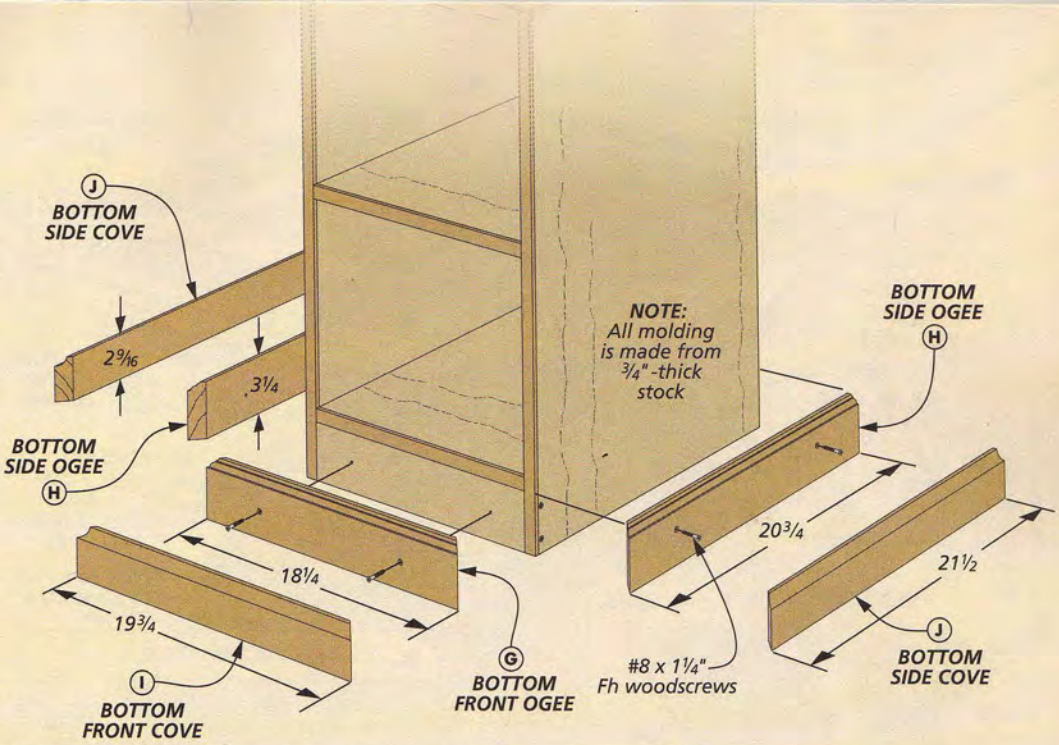
ROUTING THE OGEE PROFILE. The inner layer of molding features a classic Roman ogee profile. You can see the router bit I used to make this profile in the photo in the margin at right. But before you begin to rout the molding, it's a good idea to set up the router table for a trial run, using a test piece.

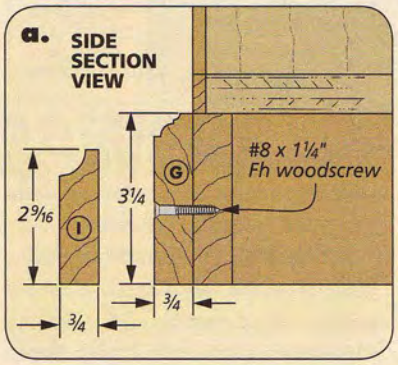
I used a featherboard mounted on the router table fence to hold the workpieces flat against the surface of the table. This way, you'll be assured of a consistent profile. The box below shows you what I'm talking about.

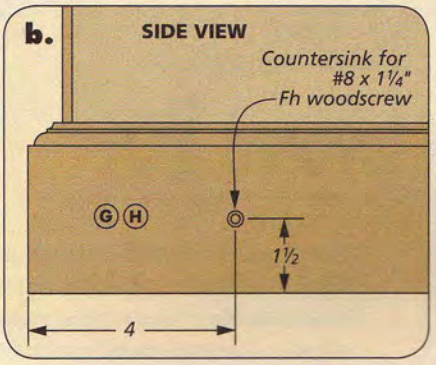
I cut the blanks for front and side pieces to rough length first, leaving them a few inches long to be able to cut the miters later. I found it a little easier to rout them accurately when rough cut to length, rather than trying to rout one long workpiece.

CUT THE MITERS. After you've completed routing the ogees, it's time to cut the miters and attach the pieces to the case. It's easiest to start with the front piece first, and then cut the sides to length after fitting the miters. When you finish test fitting the molding, move to the drill press to drill countersunk holes for screws. This makes it easy to attach the molding with short screws. You don't need to worry about the screw heads being visible — they'll be covered by the next layer of molding.

ADD THE COVE MOLDING. The cove molding will go on next. You can use the same procedures for routing and fitting these pieces as you did for the ogee molding. The only difference is that these pieces will be glued in place rather than

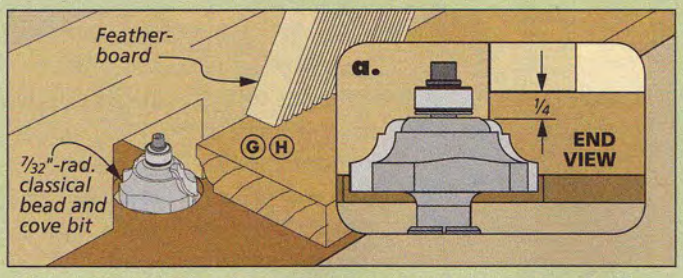




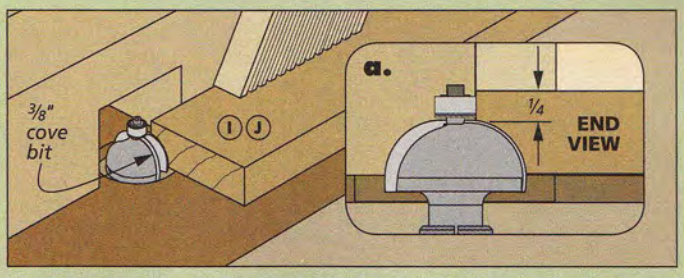


▲ A classic Roman ogee bit (sometimes called a bead and cove bit) creates the molding profile.

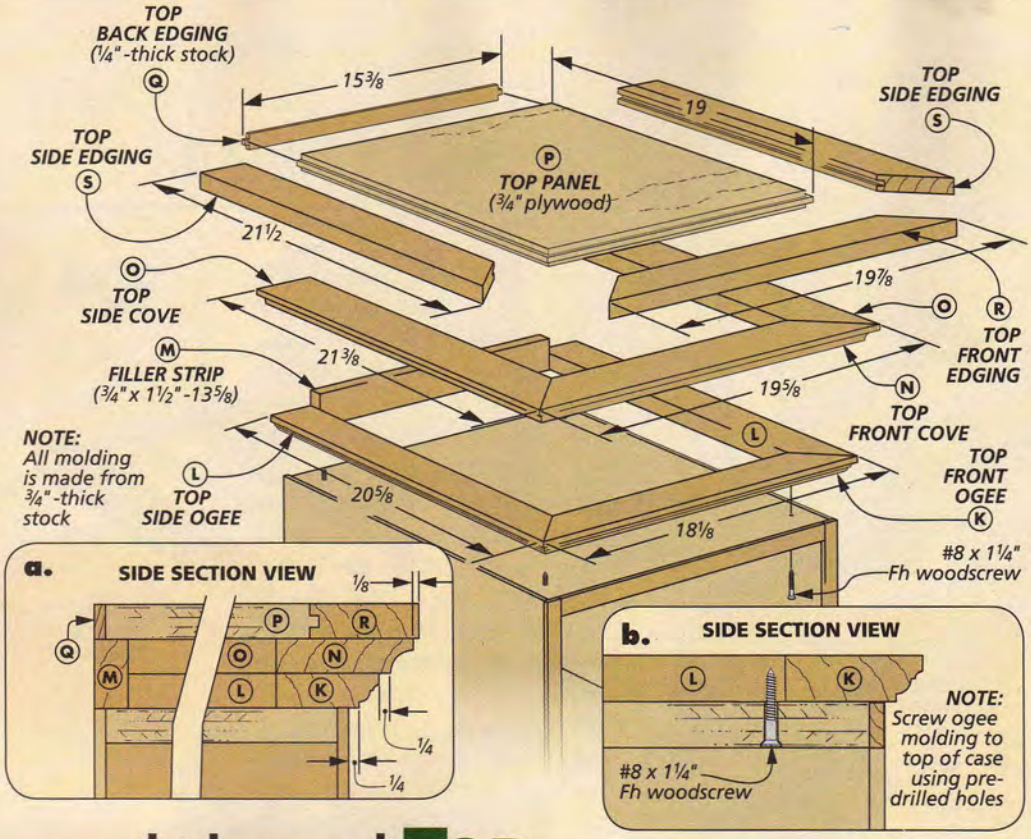
Routing Clean Profiles

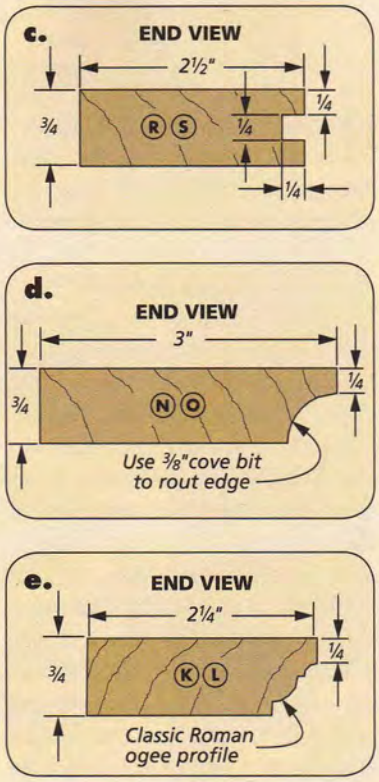


Make Two Passes. *To avoid tearout, start by setting the fence forward to remove less material for the first pass (detail 'a'). Then move it back slightly for a final cleanup pass.*



Featherboards Help Make Clean Cuts. *Adding a featherboard to the router fence keeps the workpiece tight against the table ensuring a smooth, consistent cut.*





multi-layered TOP

After you've completed the molding on the bottom, the next step is to add the top. This time the molding is applied horizontally to create a built-up assembly. I found it was easier to size the pieces accurately by starting with the bottom layer and building up to the top.

THE OGEE LAYER. The first layer of molding has the same ogee profile that was used on the base. You can use the same process as before for routing the molding. The main drawing above shows how this layer is mitered and attaches with screws from inside the case.

ADD THE COVES. To mirror the profile of the base, the next layer has a cove profile. After routing and mitering these pieces, you can attach them to the ogee layer with glue. You'll want to be careful to align this layer so it's evenly spaced. Detail 'a' will help you here.

I added a filler strip on the back edge. By sizing the filler to equal the thickness of the two layers of molding, it fills the void in the back and will support the top.

THE PLYWOOD TOP. The final layer of the top assembly is a plywood top panel wrapped in hardwood edging. You can begin by cutting the edging to rough length.

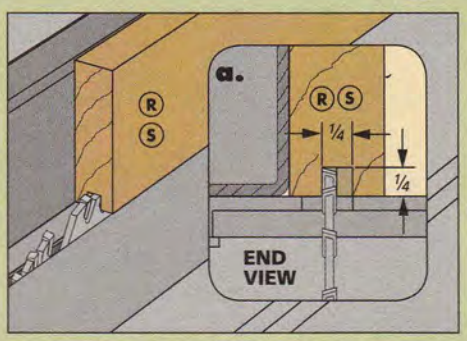
The box below shows how to cut the tongue and groove joinery at the table saw using a straightforward setup and an auxiliary fence. Start by cutting the grooves in the edging first. This way, you can match the tongue to the width of the groove.

Now you can cut the plywood panel to size and attach a thin strip of edging on the back edge. This piece has to be glued in place before you can cut the tongue on the panel.

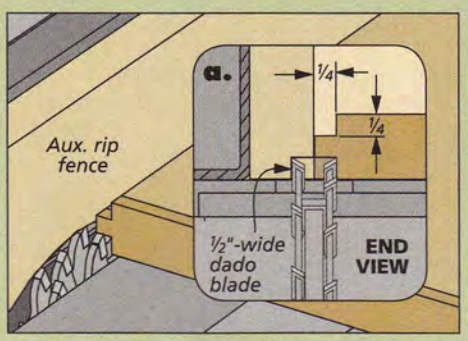
When the glue dries, just cut the tongue on the plywood panel to fit into the grooves. It's pretty easy to get a snug fit by taking light cuts, testing for a good fit after each pass. After completing the cuts, you can miter the edging pieces and glue them in place around the top.

ASSEMBLE THE TOP. When the glue dries on the edging, it's a simple matter to fit the top in place over the cove layer of molding. Once again, make sure to keep it properly positioned on all sides. Then, a little glue and a few clamps are all it takes to attach the assembly, completing the built-up top.

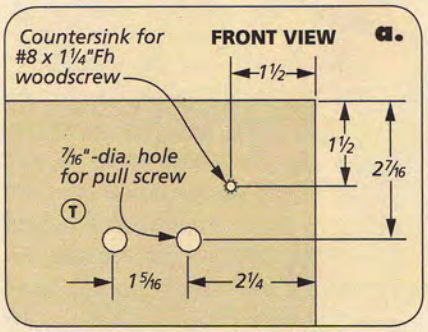
How-To: Cut Tongue & Groove Joints

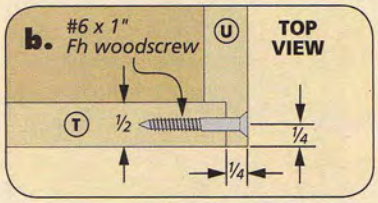


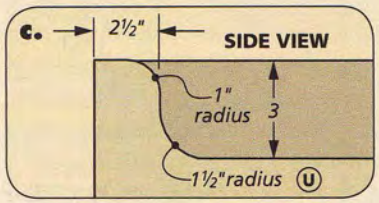
Center the Groove. *Make the first cut with the blade slightly off center, then flip the workpiece end for end and repeat the cut.*

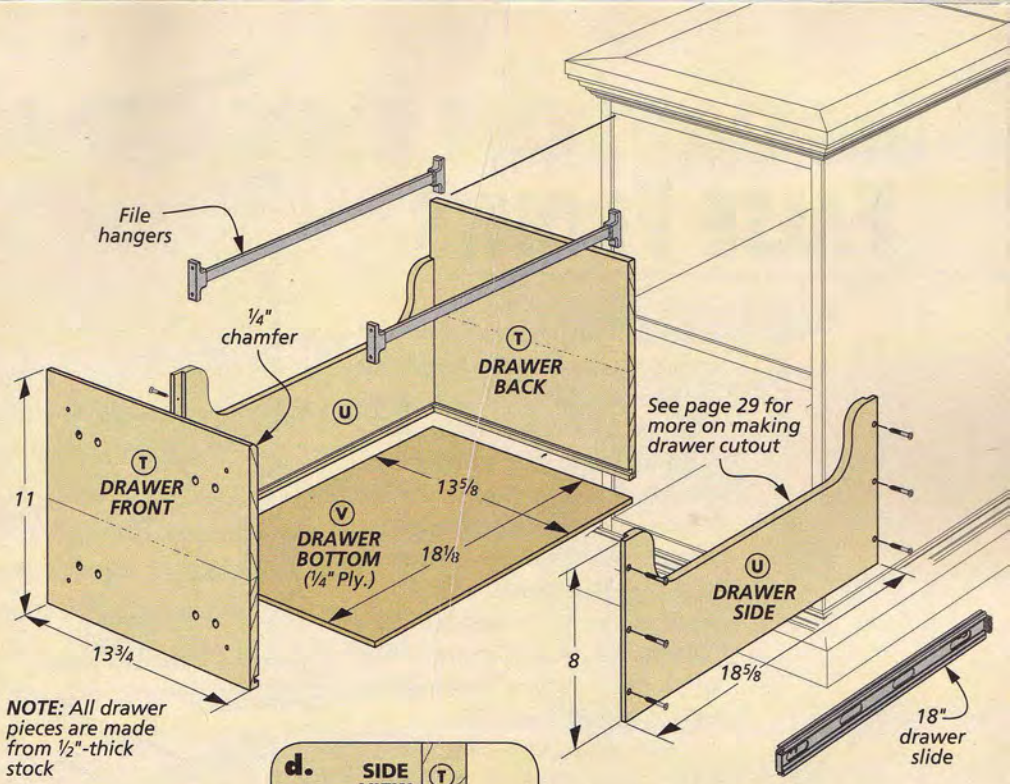


Cut the Tongue to Fit. *Start with the blade low and raise it in small increments to sneak up on a tight fit for the tongue.*

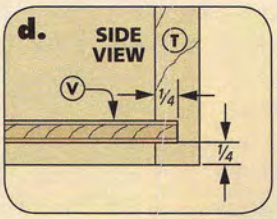








NOTE: All drawer pieces are made from ½"-thick stock



easy-to-build DRAWERS

Now that the case is fully assembled, you're ready to move on to building the drawers. To keep things simple, I used rabbet joints reinforced with screws to join the drawer parts. This way, they're quick to build and plenty strong.

PREPARATION. I chose maple for the drawers because it's very strong and looks great as a secondary wood. You'll probably need to glue narrower pieces together to get the width necessary for the drawer parts. I started by gluing up plenty of ½"-thick stock.

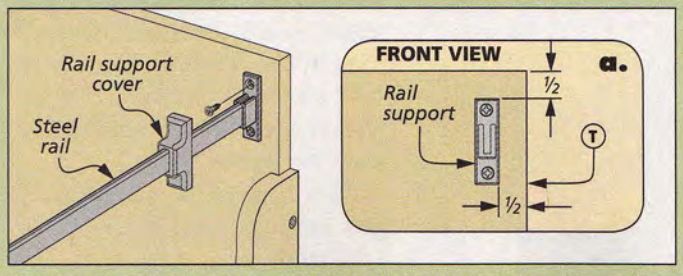
DRAWER FRONTS & BACKS. I cut the fronts and backs to final size and added a ¼" chamfer to the inside upper edge. Then take the fronts to the drill press and drill holes for attaching the false fronts and the pulls as shown in detail 'a.'

CUT OUT THE SIDES. Now you can cut the sides to size and rabbet the ends to hold the front and back. This is also a good time to cut the groove that holds the drawer bottom. Shop Notebook on page 29 has some tips for cutting the rounded shape of the drawer sides.

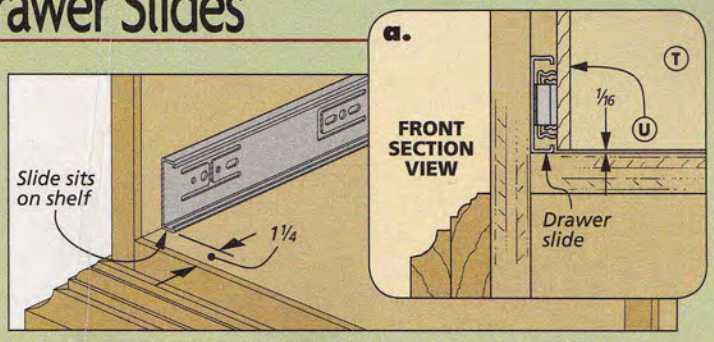
ASSEMBLE THE DRAWERS. To complete the drawers, cut the ¼" plywood bottoms and you're ready for assembly. Using glue and screws to join the pieces, this goes pretty quickly.

ADD THE FILE HANGERS AND SLIDES. With the drawer boxes complete, I installed the file hangers, as shown in the box below. Then you can attach the drawer slides. I chose full-extension slides to make it easier to get to the files in the back of the drawer. The box below will show you how to position the slides on the drawers and in the case.

How-To: Install File Hangers & Drawer Slides

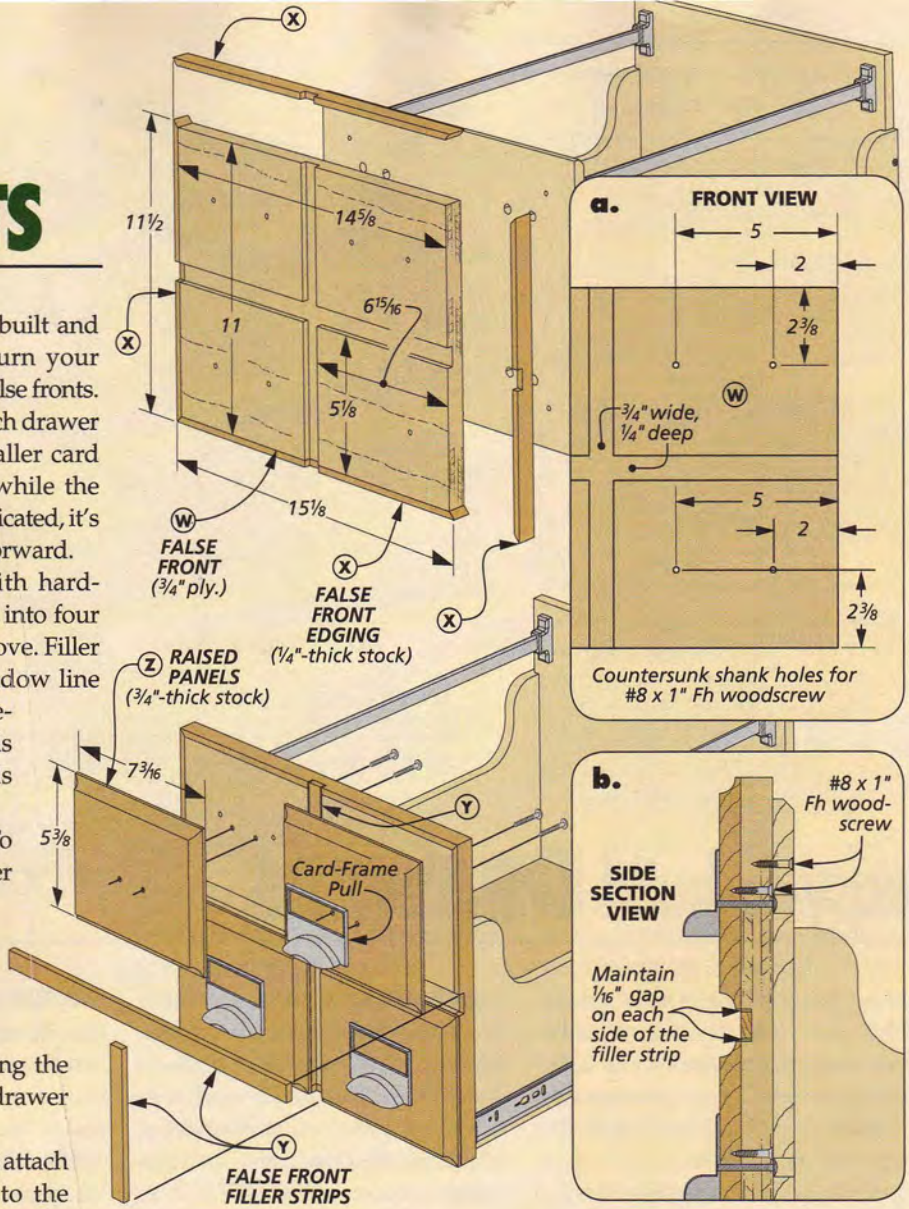


Sturdy File Hangers. *Install the rail support on the drawer front and back. After cutting the rails to length, slide the cover on the rail and place it in the support. The cover then snaps in place.*



Full-Extension Drawer Slides. *Top-quality drawer slides can handle the load of heavy files. Position the slides as shown and attach to the drawer box and case using screws.*

drawer
FALSE FRONTS



With the drawer boxes built and installed, it's time to turn your attention to adding the false fronts. This treatment makes each drawer front look like four smaller card catalog drawers. And while the construction looks complicated, it's actually pretty straightforward.

A plywood panel with hardwood edging is divided into four fields by a dado and groove. Filler strips leave a slight shadow line to add depth, and cove-edged hardwood panels with card-frame pulls complete the illusion.

PLYWOOD FALSE FRONT. To get started on the drawer fronts, you can cut the false front panels to size. As you can see in the illustration at right, you'll also need to drill holes for attaching the raised panels and the drawer pulls (detail 'a').

The next thing to do is attach the hardwood edging to the panels. I cut this at the table saw, and mitered the corners around the panel's edges.

With the edging attached, you can move back to the table saw and cut the dado and groove in each of the panels. The box below illustrates this procedure.

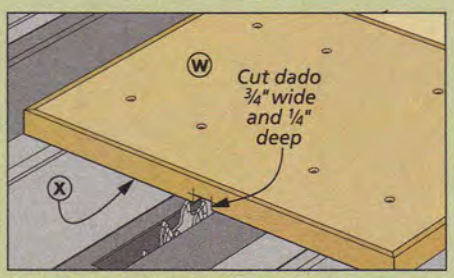
ADD THE FILLER STRIPS. Now you'll need to cut some thin hardwood strips to fill the dado and groove in the panel. This time, however, the strips are only ⅝" wide to create the shadow line between the panels. The easiest way to do this is to plane a board to ⅝" thick first, then cut the strips from the edge of the blank. It's a good idea to test fit a strip in the dado for a good fit.

To install the strips, start by gluing the horizontal piece in the groove. Center the strips with a ¹⁄₁₆" gap on the sides (detail 'b'). Then cut the vertical pieces and install them to fit flush with the edges.

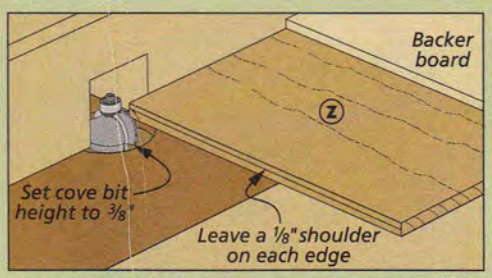
RAISED PANELS. The last layer of the built-up false front consists of four raised panels mounted on each drawer. The panels are made from ½"-thick stock. I routed a cove on all four edges of each panel to give them the "raised" look.

After cutting the panels to size, you can head over to the router table and install a cove bit. The illustration at left shows how to rotate the workpiece to prevent tearout while routing the panels.

How-To: False Fronts & Raised Panels



Cut the Dado and Groove. *After applying the edging, cut the dado and groove using a dado blade on the table saw.*



Raised Panels. *Rout a cove on all four edges to give the panels a raised look. Start with the ends, then rout the top and bottom edges.*

ASSEMBLING THE FALSE FRONTS. After you've completed the panels, just give them a good sanding and they're ready to install. Aligning the panels is easy since they fit flush on the two outside edges. All you have to do is apply a little glue to the panels and line up those edges and clamp them in place. After the glue has dried enough to hold them in position, you can flip the assembly over and add screws from the back of the false front.

ATTACH DRAWER PULLS. Since you've already predrilled screw holes in the plywood false front for the pulls, attaching them is a breeze. Just use those holes as a guide to finish drilling through the raised panels. Then you can install the pulls using machine screws.

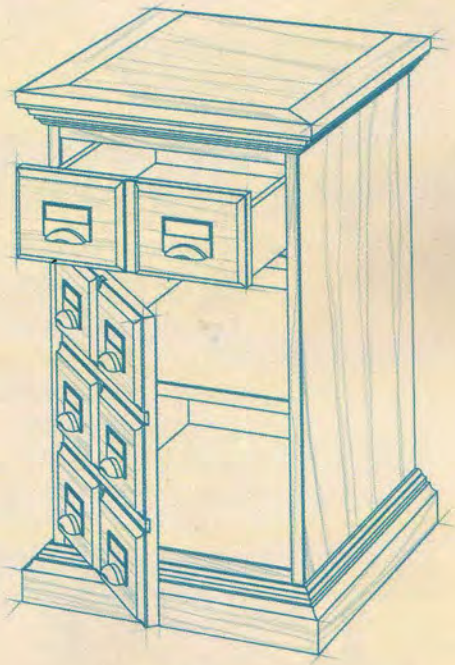
Now all that remains is to add the stain and finish of your choice. I used a natural oak stain and lacquer to preserve the classic oak look. Once you've finished the cabinet, you'll not only appreciate the extra storage, but the design as well. W

DESIGNER'S NOTEBOOK

If you like the look of the cabinet but don't need the file storage, you can always customize the design to suit your needs. In the drawing at right, you can see how making a couple of simple modifications provides a different kind of storage while preserving the character of the card catalog design.

In this version, the case and moldings on the cabinet remain unchanged. But instead of two large file drawers, it features a slimmer profile drawer on top and an open storage cabinet with a shelf below. This would be a great configuration for a night stand or hall cabinet. A pair of these cabinets might also make good pedestals for a desk.

If you're interested in building the modified cabinet, you can find the details on our website at www.Woodsmith.com.



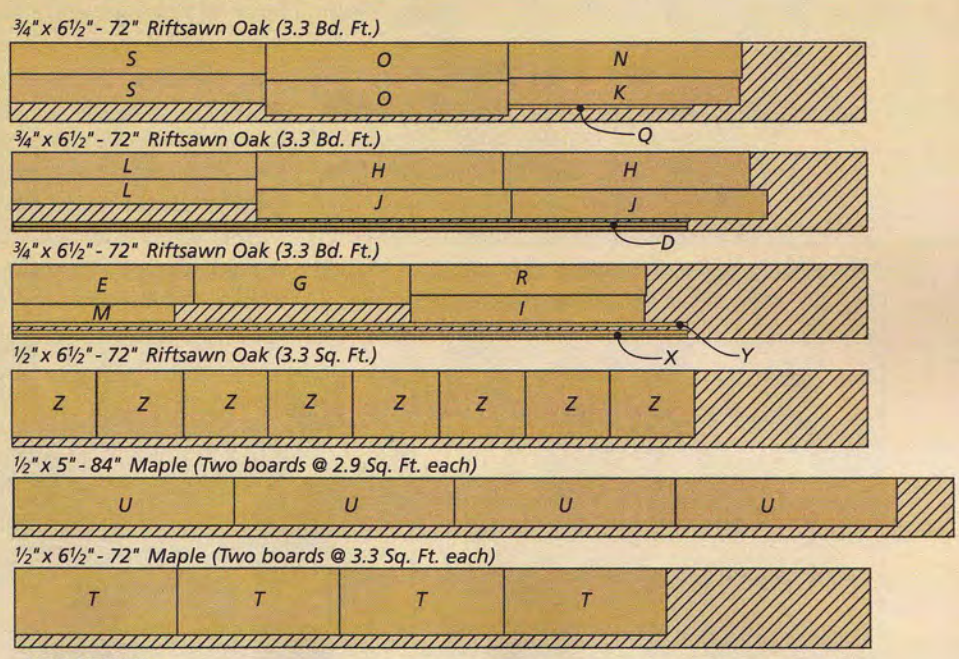
Woodsmith GO ONLINE EXTRAS

For detailed plans for modifying this cabinet, visit our website at www.Woodsmith.com

Materials, Supplies & Cutting Diagram

A	Case Sides (2)	3/4 ply. - 19 3/4 x 28 3/4
B	Case Shelf/Bottom (2)	3/4 ply. - 19 1/2 x 15 3/4
C	Case Top (1)	3/4 ply. - 19 1/2 x 16 1/4
D	Case Edging (1)	1/4 x 3/4 - 105 rgh.
E	Bottom Rail (1)	3/4 x 3 1/4 - 15 1/4
F	Case Back (1)	1/4 ply. - 16 1/4 x 25 1/2
G	Bottom Front Ogee (1)	3/4 x 3 1/4 - 18 1/4
H	Bottom Side Ogee (2)	3/4 x 3 1/4 - 20 3/4
I	Bottom Front Cove (1)	3/4 x 2 9/16 - 19 3/4
J	Bottom Side Cove (2)	3/4 x 2 9/16 - 21 1/2
K	Top Front Ogee (1)	3/4 x 2 1/4 - 18 1/8
L	Top Side Ogee (2)	3/4 x 2 1/4 - 20 5/8
M	Filler Strip (1)	3/4 x 1 1/2 - 13 5/8
N	Top Front Cove (1)	3/4 x 3 - 19 5/8
O	Top Side Cove (2)	3/4 x 3 - 21 3/8
P	Top Panel (1)	3/4 ply. -19 x 15 3/8
Q	Top Back Edging (1)	1/4 x 3/4 - 15 3/8
R	Top Front Edging (1)	3/4 x 2 1/2 - 19 7/8
S	Top Side Edging (2)	3/4 x 2 1/2 - 21 1/2
T	Drawer Fronts/Backs (4)	1/2 x 11 - 13 3/4
U	Drawer Sides (4)	1/2 x 8 - 18 5/8
V	Drawer Bottoms (2)	1/4 ply. - 13 5/8 x 18 1/8
W	False Fronts (2)	3/4 ply. - 11 x 14 5/8
X	False Front Edging (1)	1/4 x 3/4 - 115 rgh.
Y	False Front Filler Strips (1)	1/4 x 5/8 - 56 rgh.
Z	Raised Panels (8)	1/2 x 5 3/8 - 7 3/16

- (22) #8 x 1 1/4" Fh Woodscrews
- (16) #8 x 1" Fh Woodscrews
- (32) #6 x 1" Fh Woodscrews
- (16) #8 x 1 3/4" Rh Machine screws
- (2 pr.) File Hangers
- (8) Card-Frame Drawer Pulls
- (2 pr.) 18" Drawer Slides w/Screws



ALSO NEEDED:
One - 48" x 96" sheet 3/4" Oak plywood
One - 48" x 48" sheet 1/4" Oak plywood

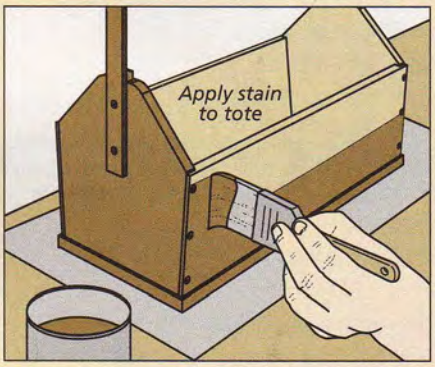
SHOP NOTEBOOK

Aged Paint Finish

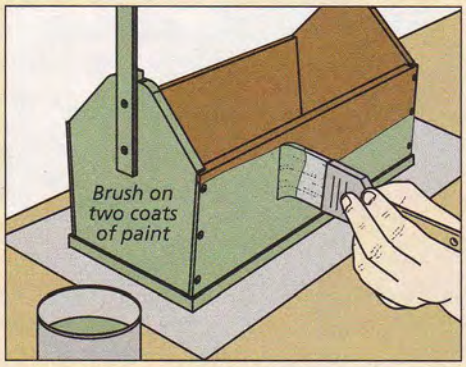
One way to dramatically change the look of the tote box on page 16 is to go with a painted finish. To give the box even more character, I decided to use a five-step finishing process to make the paint look "aged," as if it had seen many years of use (drawings below).

To start with, I stained the entire project to give the wood the look of aged pine. Once the stain was dry, I sealed it with a thin coat of orange shellac. Then I brushed on a couple of coats of flat, latex paint that had been thinned by mixing it with water (a 50/50 mixture).

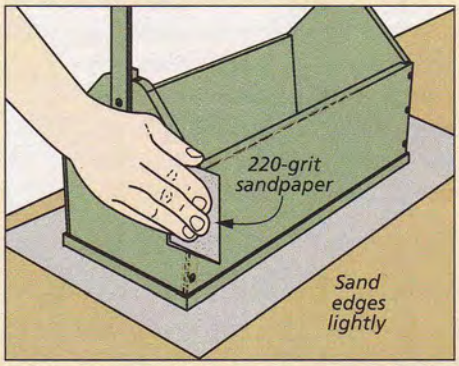
AGING. To add some wear, I lightly sanded through the paint in a few areas. The trick here is not to overdo it. I primarily sanded the edges and the corners — places you would expect to see wear. Then wiping on a final coat of stain adds another layer of "age" to the project.



Stain. *To give the tote the look of aged wood, apply an undercoat of mahogany stain, followed by a thin coat of shellac.*



Paint. *Next, you can brush on a couple coats of thinned, flat, latex paint. Go ahead and paint over the screw heads as well.*



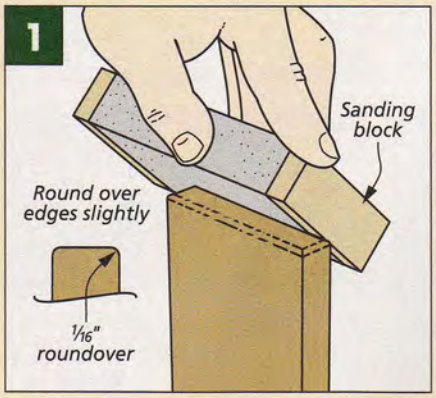
Add Wear. *Using fine sandpaper, lightly sand through the paint at the edges and corners. Then wipe on a final coat of stain.*

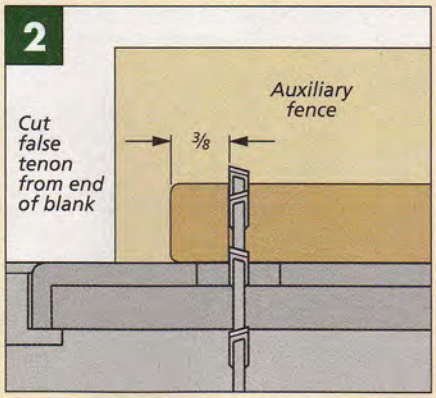
False Tenons

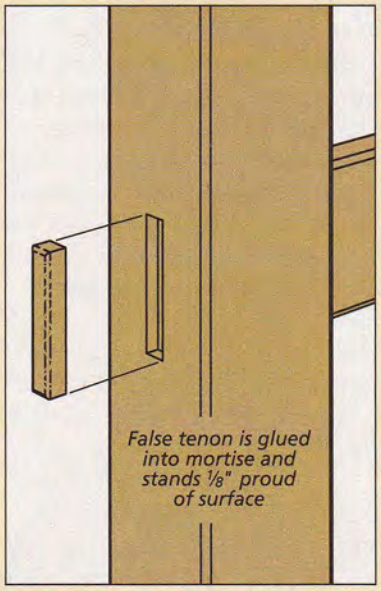
Making the false tenons for the library table on page 30 posed a bit of a challenge. Because the false tenons are cut from end grain, you can't simply cut them from a long, narrow strip of wood.

The solution is a simple one. I planed down a blank to match the width of the mortise, and ripped it to match the length of the mortise. Then, using a sanding block, I rounded over the ends (Figure 1).

After cutting the false tenon free at the table saw (Figure 2), simply round over the ends of the blank again to make the next tenon.







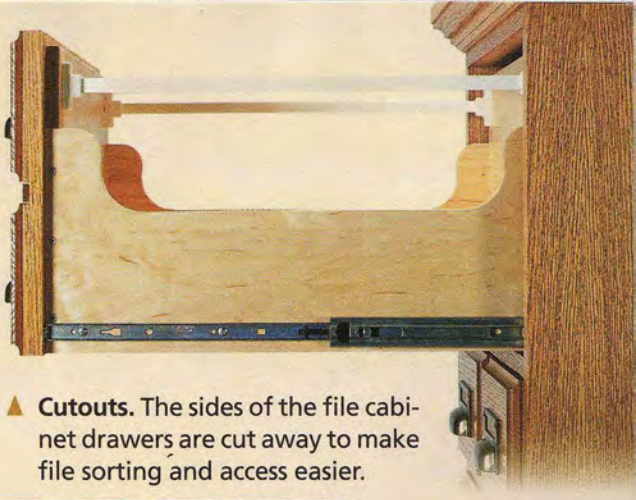
False Tenons. *End grain plugs give the library table the look of through tenons — without all the work.*

Drawer Side Cutouts

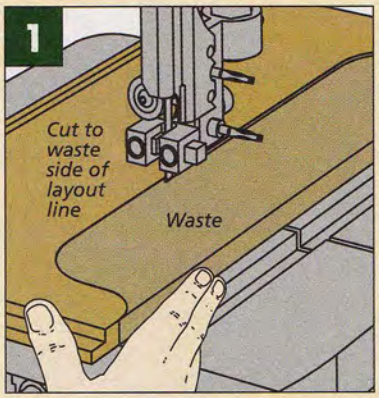
The sides of the drawers of the file storage cabinet on page 20 feature a curved cutout. This cutout makes it easier to sort through the file.

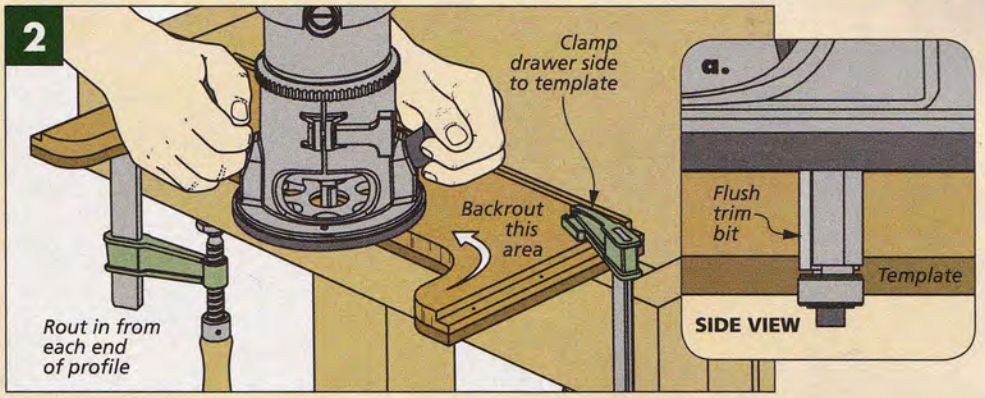
To keep the cutouts identical, I made a template of the profile out of ¼" hardboard. I used the template to lay out the profile on my drawer sides. Then I cut away the waste on the band saw, staying just to the outside of the layout line, as shown in Figure 1.

To smooth the profile, I clamped the drawer side and the template to the end of my workbench. Then as you can see in Figure 2, I used a router and flush trim bit to remove the remaining waste. But in order to avoid tearout, I routed in from each end of the profile.



▲ **Cutouts.** The sides of the file cabinet drawers are cut away to make file sorting and access easier.





Dowel Joinery

When it came to adding the corbels to the library table, I decided to use dowels to reinforce the joint between the end of the corbel and the rails (drawing at right). This created a couple of challenges.

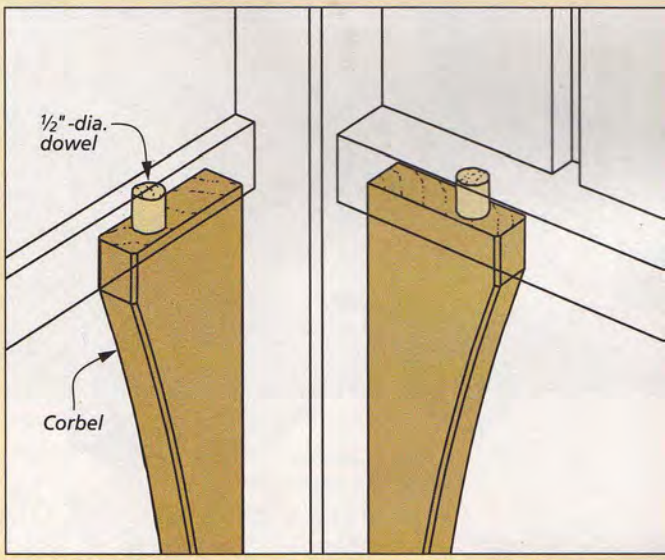
The first was figuring out a way to drill the holes for the dowels in the ends of the corbels. Drilling into hard end grain is never easy, especially in oak. The drill bit tends to wander off course.

The solution was to clamp each corbel in the vise on my workbench and use a doweling jig and a handheld drill to drill the hole (Figure 1). The doweling jig guides the drill bit and prevents it from wandering.

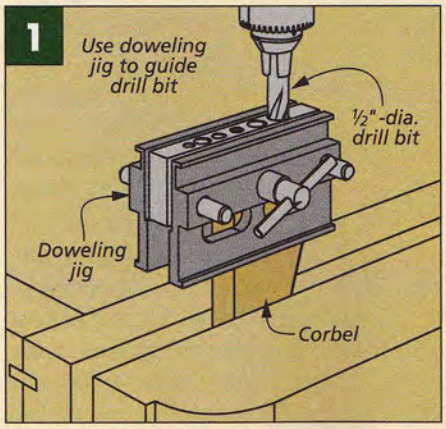
TRANSFER LOCATIONS. The second challenge was to come up with a way to accurately transfer the location of the holes from the corbels to the bottom of the rail or ledger.

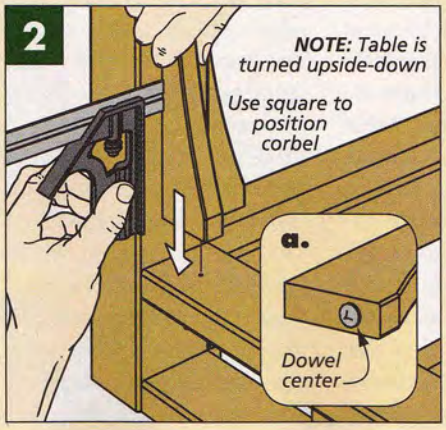
To do this, I simply placed a dowel center in the hole I just drilled in the end of the corbel. Then, using a combination square to help position the corbel, I pressed it in place against the ledger. The dowel center presses into the wood, creating a dimple on the rail or ledger, as shown in Figure 2.

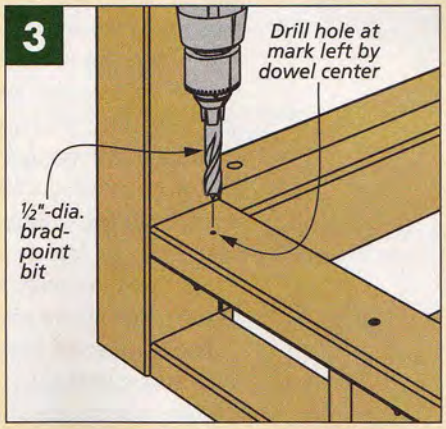
Then it's just a matter of drilling matching holes in the rails for the dowels (Figure 3) and gluing the corbels in place. W

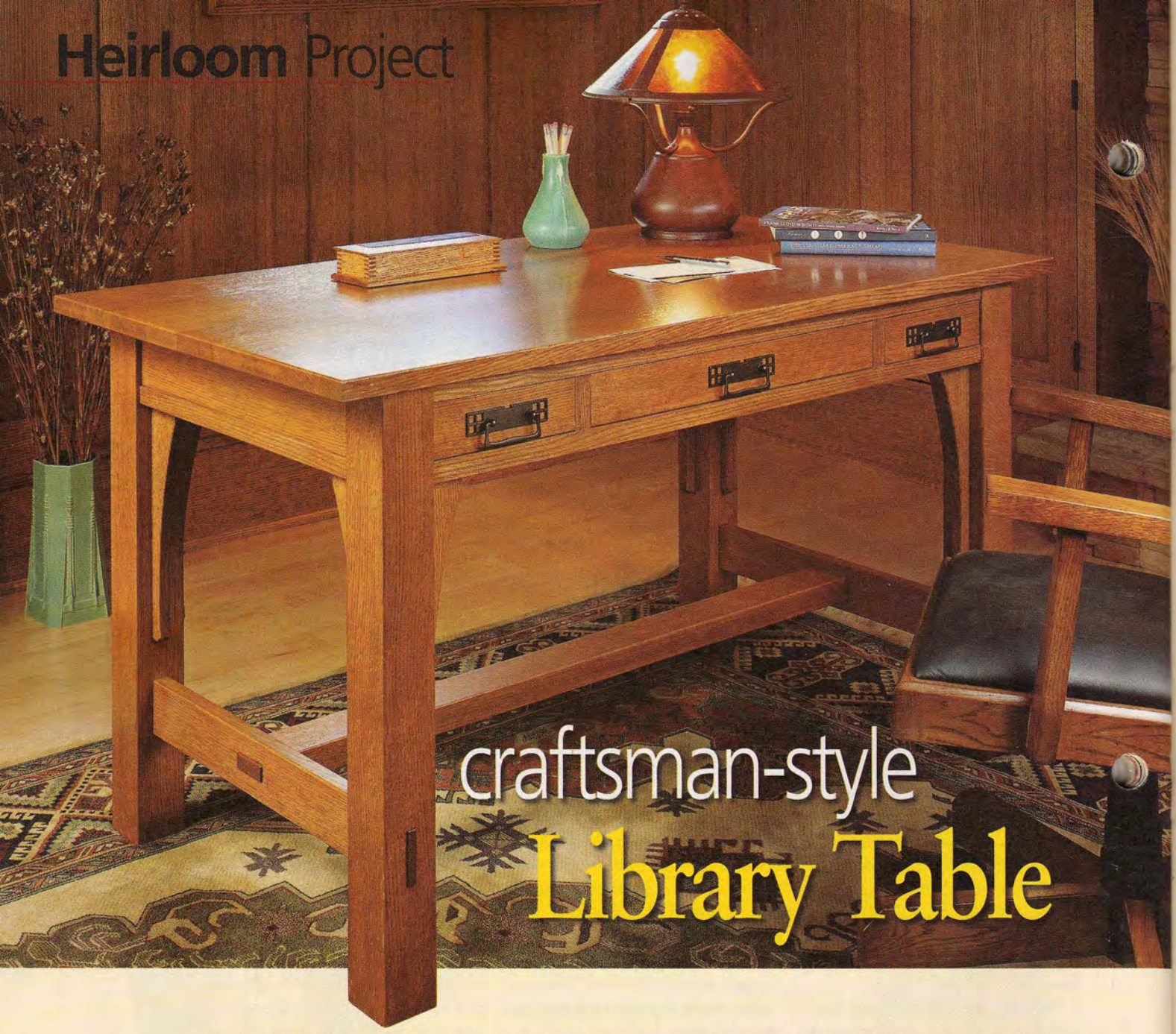


Dowel Joint. *Dowels are used to strengthen the joint between the corbels and the rails of the table.*









craftsman-style Library Table

This classic project offers Craftsman design at its best. It's practical, simple in detail, and features solid, straightforward construction.

Craftsman-style furniture is always easy to recognize. That's because it's based on well established design philosophy. In a nutshell, the basic principles are that furniture should be simple in design, highly practical, and built to pass down from generation to generation. And one look is all you need to tell that the classic library table in the photo above hits the mark.

The Craftsman heritage of our table is unmistakable. It starts with a solidly built frame that supports a beefy top. The square, gently eased edges create clean, crisp lines. The minimal amount of aesthetic detail is added by the appearance of through-tenon joinery and the gracefully shaped corbels atached beneath the upper rails.

But here, form follows function. This table is meant to fulfill a purpose and the possibilities are pretty wide open. The spacious top provide plenty of display space or a comfortable work surface. When you consider the three shallow drawers for storage, the library table is a good candidate for use as an accommodating desk.

But all this aside, what appeals to me most about this project is the time spent building it. As it should be, the construction is very down to earth — just traditional joinery and techniques that will give your woodworking skills a good workout. And in the end, you'll have a treasured heirloom that looks great and will serve you well today and far into the future.

CONSTRUCTION DETAILS

OVERALL DIMENSIONS: 54"W x 28"D x 30"H

Large top is glued up from 1"-thick stock

***NOTE:** Sturdy base is built with mortise and tenon joinery*

***NOTE:** Main parts of table are quartersawn white oak*

***NOTE:** Drawer support system designed for easy installation after base is assembled*

Figure-eight fastener

Side-mount drawers slide on hardwood runners

Craftsman-style drawer pulls complement simple design of table

Shallow drawers add versatile storage

Routed profile on drawer sides softens edges and adds traditional detail

Gently curved corbels lighten the appearance of large table

***NOTE:** Drawer sides and back are maple, bottom is plywood*

Stretcher strengthens base

Drawers use rigid, half-blind dovetail joinery

Stretcher joint reinforced with screws

False tenon

False tenon hides screws and creates appearance of through-tenon joinery

Legs use glue-up technique that creates quartersawn appearance on all four faces

FRONT SECTION VIEW

Top is easily fastened to base with figure-eight fasteners

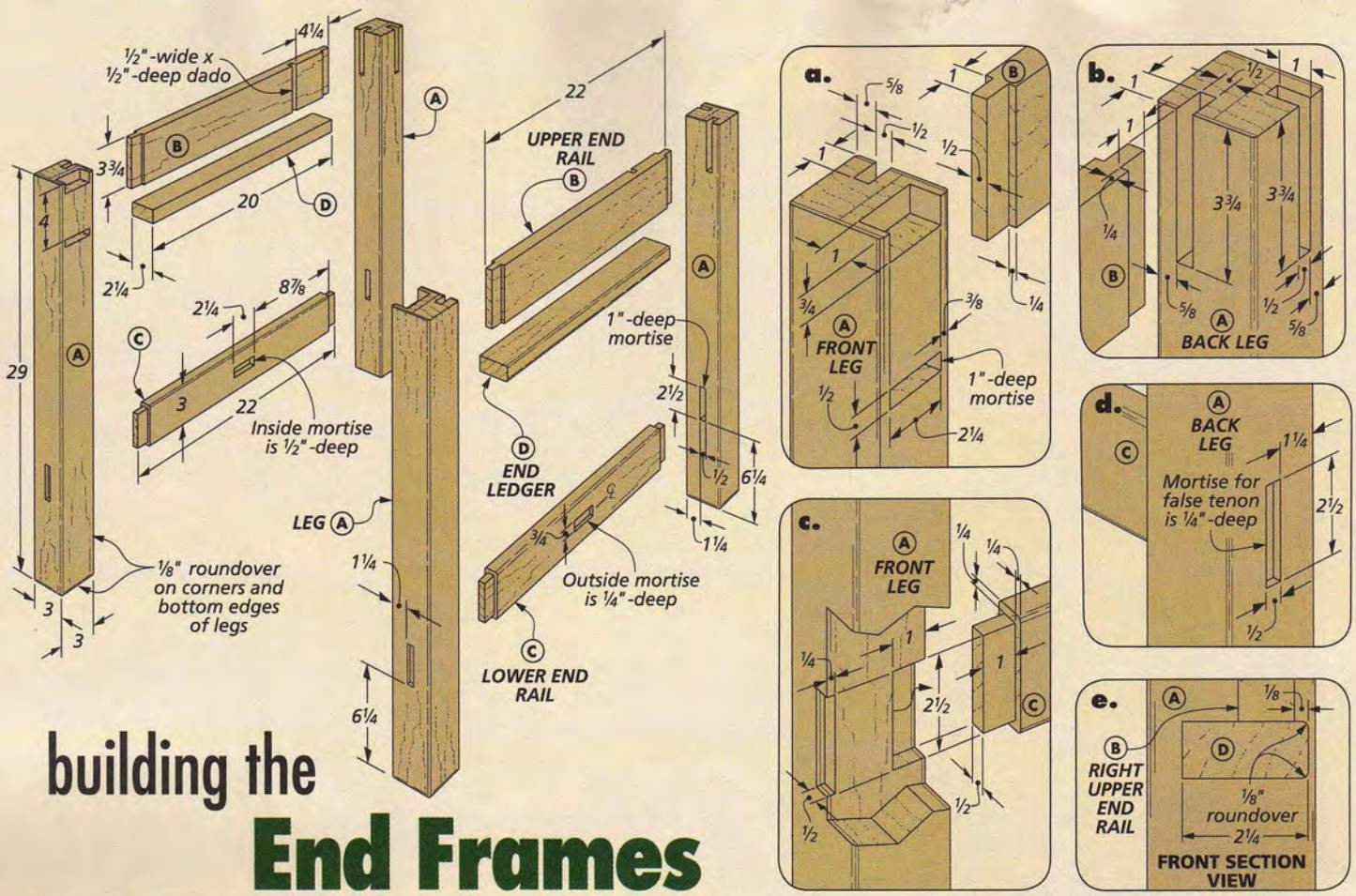
Decorative profile routed on top edges of drawer sides

Ledgers stand proud of base rails

Maple plywood drawer bottom

Corbels attach to base with dowels and glue

***NOTE:** For sources of hardware, see page 51*



building the End Frames

I decided that the easiest way to build the table was to start by assembling the two, basic end frames. Then you can quickly complete the sturdy base by adding the front and rear rails, the center stretcher and all the details.

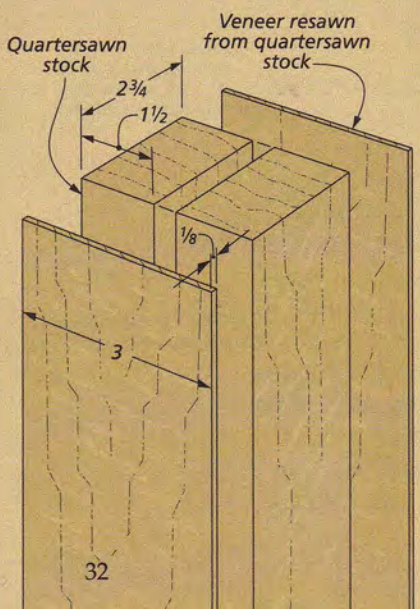
LEGS FIRST. Each end frame consists of two legs, a two–piece upper rail and a lower rail, as shown above. To begin, you'll need to make the four, stout, 3"-square legs. As you can imagine, this requires gluing up blanks from thinner stock. But this also gives you the opportunity to make a better-looking leg. I used a traditional Craftsman technique to make leg blanks that show quartersawn figure on all four faces with no noticeable joint lines.

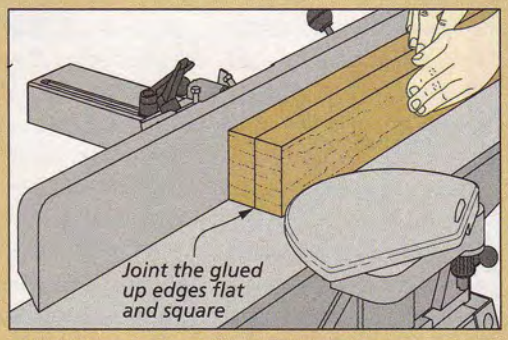
The simple process is laid out in the box below. In a nutshell, you're going to glue up a two-piece blank and then "skin" the joined sides with thin facings. The result is definitely worth the extra effort.

MORTISES. Once the leg blanks are completed and cut to final length, you can go to work on the joinery. The end rails and the front and back rails are all connected to the legs with mortise and tenon joints. So cutting all the mortises in the legs is the first step.

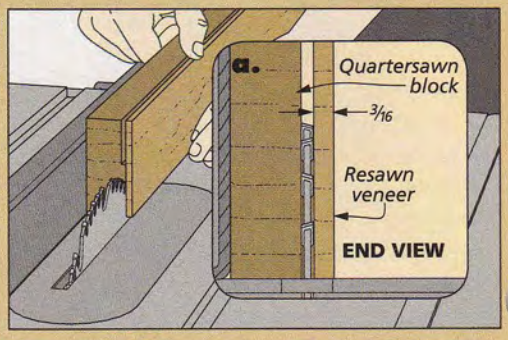
If you take a look at the drawing above, you'll see that each leg has multiple mortises. And even though you're just working on assembling the end frames at this

How-To: Make a Craftsman Leg





Size the Blank. *After gluing up an extra-wide blank from 1 1/2"-thick quartersawn stock, rip and then joint the blank down to 2 3/4" wide.*



Resaw the Veneers. *Now you'll need to resaw veneers from quartersawn stock. They should be slightly over width and over thickness.*

point, you'll want to lay out and cut all the leg mortises now. This includes the mortises for the front and back rails that are added later.

THE WORK. The goal is to end up with two, mirror-image pairs of legs (front and back). So your first concern is laying out the mortises correctly and accurately. Then drilling them out at the drill press and cleaning them up at the bench will be pretty routine.

Before getting started, let me give you a rundown of what needs to be done. As you can see in detail 'b' on the opposite page, the end rails and back rail fit into off-center, open-end mortises. The drawings at right offer a tip for making these.

I created a classic, through-tenon look on the lower end rails by using a simple, false-tenon technique. This requires cutting a 1"-deep mortise centered on the inside face of the leg and a shallow mortise on the opposite face that holds the false tenon (detail 'c').

Finally, the front legs each need two "horizontal" mortises on the front inside face for the upper and lower drawer rails (detail 'a,' left).

THE END RAILS. After completing the mortises, you'll be ready for a change of pace. Making the upper end rail assembly and the lower end rails will provide it. This work is pretty straightforward, but there are a few things to explain.

As you know, both rails are tenoned into the legs. The upper rail gets a two-shouldered tenon, the lower end rail needs a four-shouldered tenon (details 'a' and 'c'). A dado blade in the table saw will handle the job. And while the dado blade is on the saw, you can cut a ½"-wide dado across the inside face of both upper end rails (main drawing). Later, this will hold an interior rail that support the drawers.

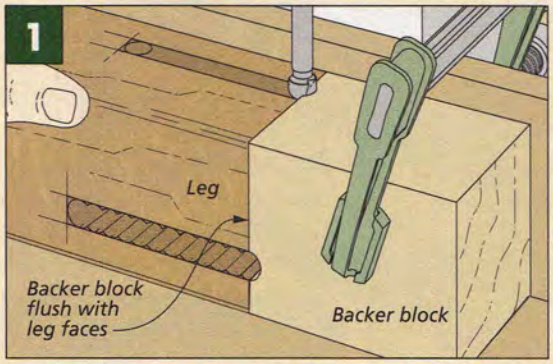
You also need to make separate horizontal ledger pieces that fit beneath the upper rail (detail 'e' at left). The ledger sits proud of the rails to create added visual interest. It will be cut to fit between the legs and glued in place, after the legs and rails are assembled.

A FEW MORE MORTISES. Completing the lower rails will take you back to the drill press and bench for a few more mortises (main drawing on the opposite page). These mortises are for the long, center stretcher that connects the two lower end rails. Here, I again used a simplified through-tenon technique. A ½"-deep mortise on the inside face captures the stretcher tenon and a separate ¼"-deep mortise on the outside fits the false tenon.

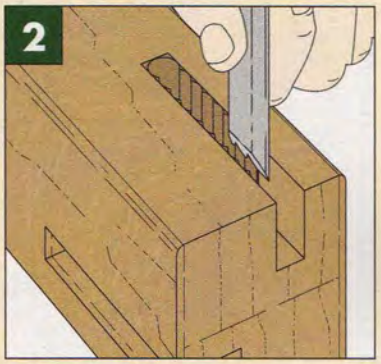
EASED EDGES. One more thing and then you can begin the assembly. I took a short trip to the router table to round over all the edges of the lower rails and the outside edges of the ledger blanks.

ASSEMBLY. According to the plan, all the end frame parts should be ready to assemble. First, I glued two legs and the upper and lower rails into a frame. Then, you can cut the ledger to fit the frame and glue it in place, as shown in detail 'e' on the opposite page.

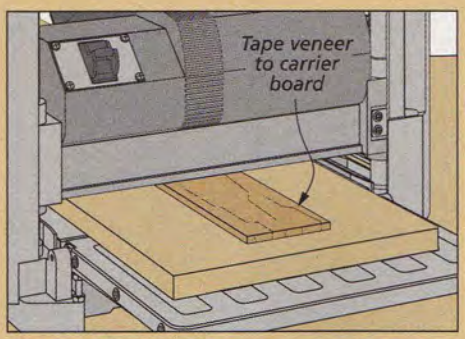
Shop Tip: Two Step Mortises



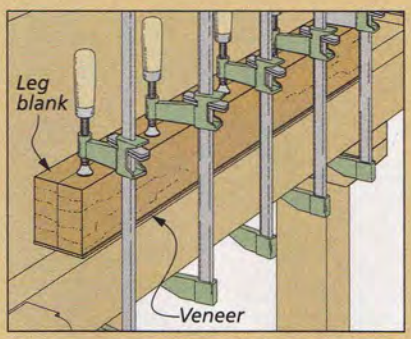
Drill Out the Waste. *Start the mortises at the drill press by drilling out most of the waste. Use a backer block at the open end to keep the drill bit on track.*



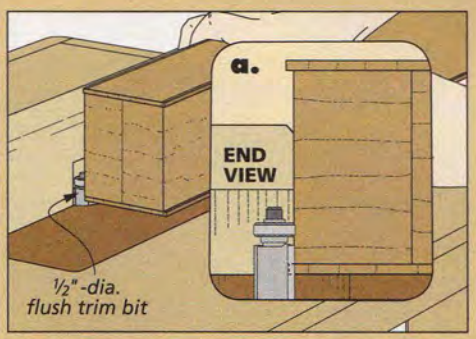
Cleanup. *Sharp chisels will complete the job. Pare away the remaining waste and square up the ends.*



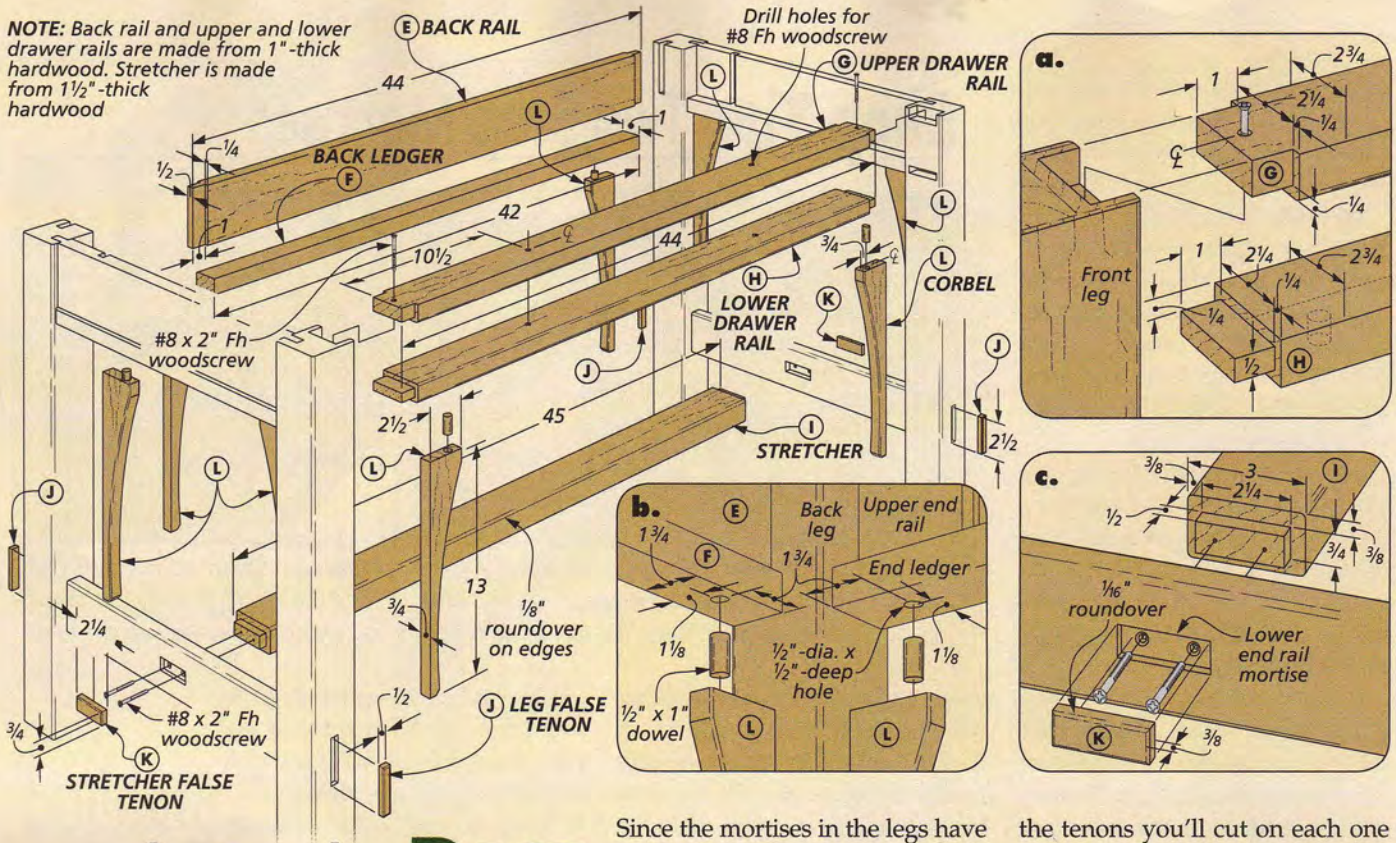
Plane the Veneers. *Next, I planed the veneers to ⅛" thick by attaching them to a carrier board with double-sided tape.*



Glueup. *You can glue the veneers to the joined edges using the workbench to distribute the clamping pressure.*



Flush Trim. *To complete the legs, trim the veneers flush with the blanks and then rout a ⅛" roundover on all the long edges.*



completing the BASE

With the end frames assembled, you can start on stage two of the construction. This involves making and installing the miscellaneous parts that complete the base. You'll add the back rail and drawer rails, the long center stretcher, the corbels, and the false tenons.

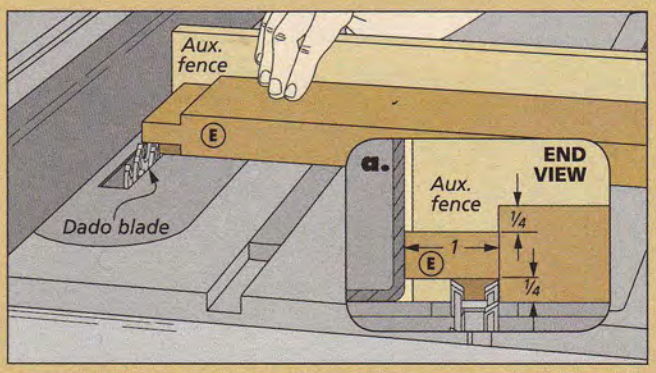
DRAWER RAILS AND BACK RAIL. Fitting the back rail and the drawer rails to the end frames is the first step. Since the mortises in the legs have been completed, you're already halfway home on this chore. The only minor complication is that the tenons on each piece are slightly different. A look at the box below will help avoid any confusion.

The back rail has the same two-piece design as the upper end rails. First, cut the back rail to size. Then cut a two-shouldered tenon on each end (first drawing below). The ledger is cut to width and rough length and the edges rounded over.

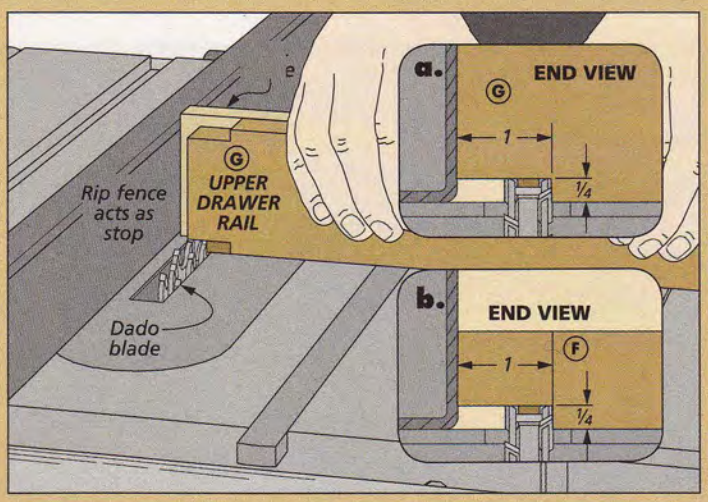
The two drawer rails are likewise, easy to fit. But as I mentioned, the tenons you'll cut on each one are a little bit different. The upper drawer rail has a three-shouldered tenon while the lower rail has a standard, four–shouldered tenon (detail 'a' above).

SCREW HOLES. Later on, you're going to add the interior support system for the three drawers. This includes two vertical divider/support rails that fit between the drawer rails. They're fastened with screws installed through the rails. So it would be a good idea to drill the countersunk screw holes in the rails before assembly.

How-To: Cut the Tenons



The Back Rail. *The back rail requires a two-shouldered tenon. After setting the rip fence to gauge the length, raise the blade between passes to sneak up on the thickness.*



Upper Drawer Rail. *The upper drawer rail has tenons with three shoulders. Here, I cut the front and back shoulders first. Then I cut the thicknesss of the tenon to match the depth of the mortise.*

THE CENTER STRETCHER. Next comes the center stretcher. Again, this part simply gets a tenon on each end. But since the stretcher fits between the lower end rails, not the legs, the trick is getting the shoulder-to-shoulder length right.

To do this, I dry fit the back rail and the drawer rails between the end frames and took a measurement. Then when you cut the tenons on the ends of the stretcher, simply sneak up on a tight fit, testing the "shoulder-to-shoulder" length to the dry fit base.

ROUNDOVER. With the stretcher fit, you need to make a return trip to the router table before assembling the base. All the edges on the stretcher and the outside edges of the drawer rails and the back ledger need a 1/8" roundover.

ASSEMBLY. The assembly will go easier if you take it in small bites. I glued the rails and stretcher to one end frame, then the other. The final step is to reinforce the upper drawer rail and the stretcher joints with screws (details 'a' and 'c').

CRAFTSMAN DETAILS. Structurally, the base is complete. But you still need to finish up the "period" details — the false tenons and the corbels.

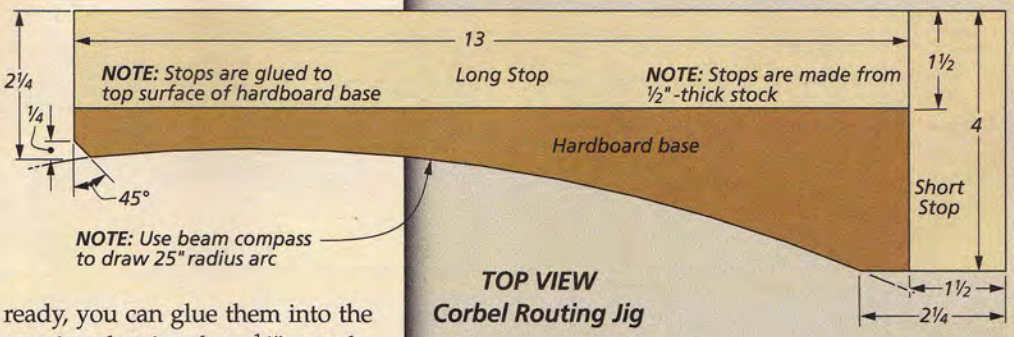
FALSE TENONS. The false tenons for the legs and those for the stretcher are different sizes, but otherwise, making them is pretty easy. The technique I used is explained in detail on page 28. When they're ready, you can glue them into the mortises, leaving them 1/8" proud.

THE CORBELS. The gracefully shaped corbels I added to the base are a distinctive feature of Craftsman furniture. They help lighten and soften the heavy look of the table.

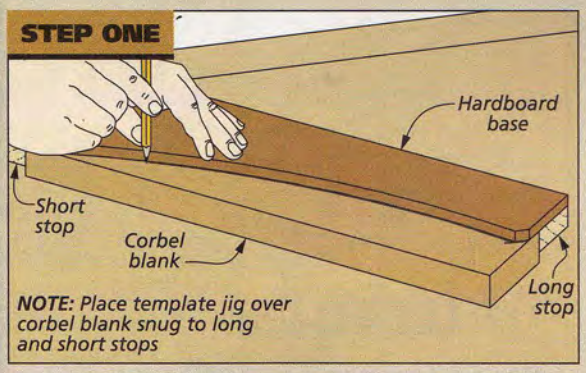
The base requires eight, identical corbels. And being a focal point, I wanted them to be smoothly shaped and consistent. So rather than shape each corbel by hand, I made a template routing jig.

The corbel jig is illustrated in the drawing at the top of the page. It's just a simple sled that used to both lay out the profile and rout it to shape. The steps for using it are shown in the box on the right. Before adding the corbels to the base, you'll rout a roundover on all the outside edges.

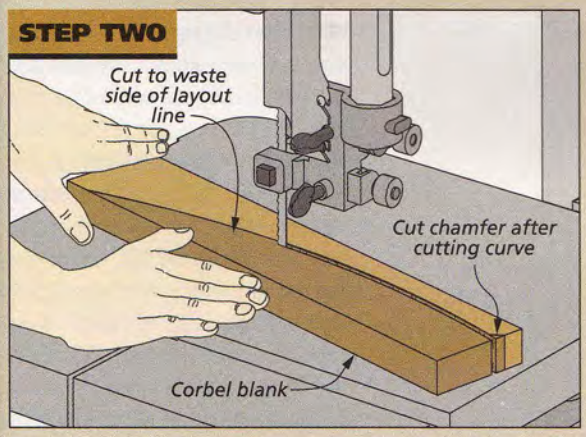
THE FINISHING TOUCH. When you attach the corbels, you want to center them on the thickness of the leg. The long edge can simply be glued to the legs. The top end needs to be doweled to the ledger or drawer rail (detail 'b,' opposite page). You'll find more information on this on page 29.



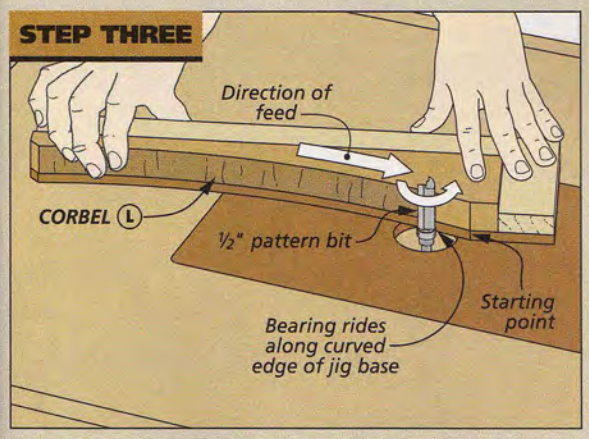
TOP VIEW
Corbel Routing Jig



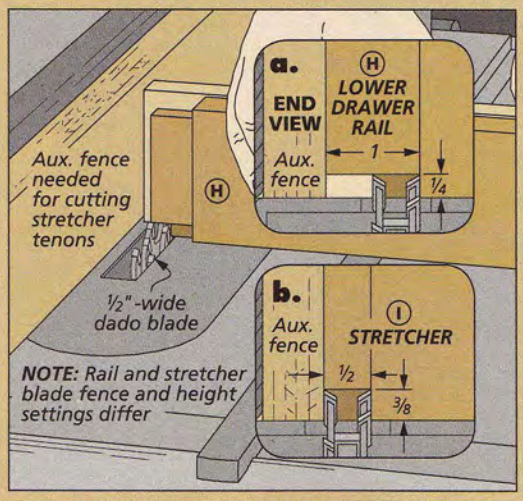
Trace the Shape. *After cutting the eight corbel blanks to width and length, use the template jig to trace the finished shape onto each blank.*



Rough Cut Each Blank. *Next, take the blanks to the band saw and cut them to rough shape. Stay about 1/16" to the outside of the layout line.*

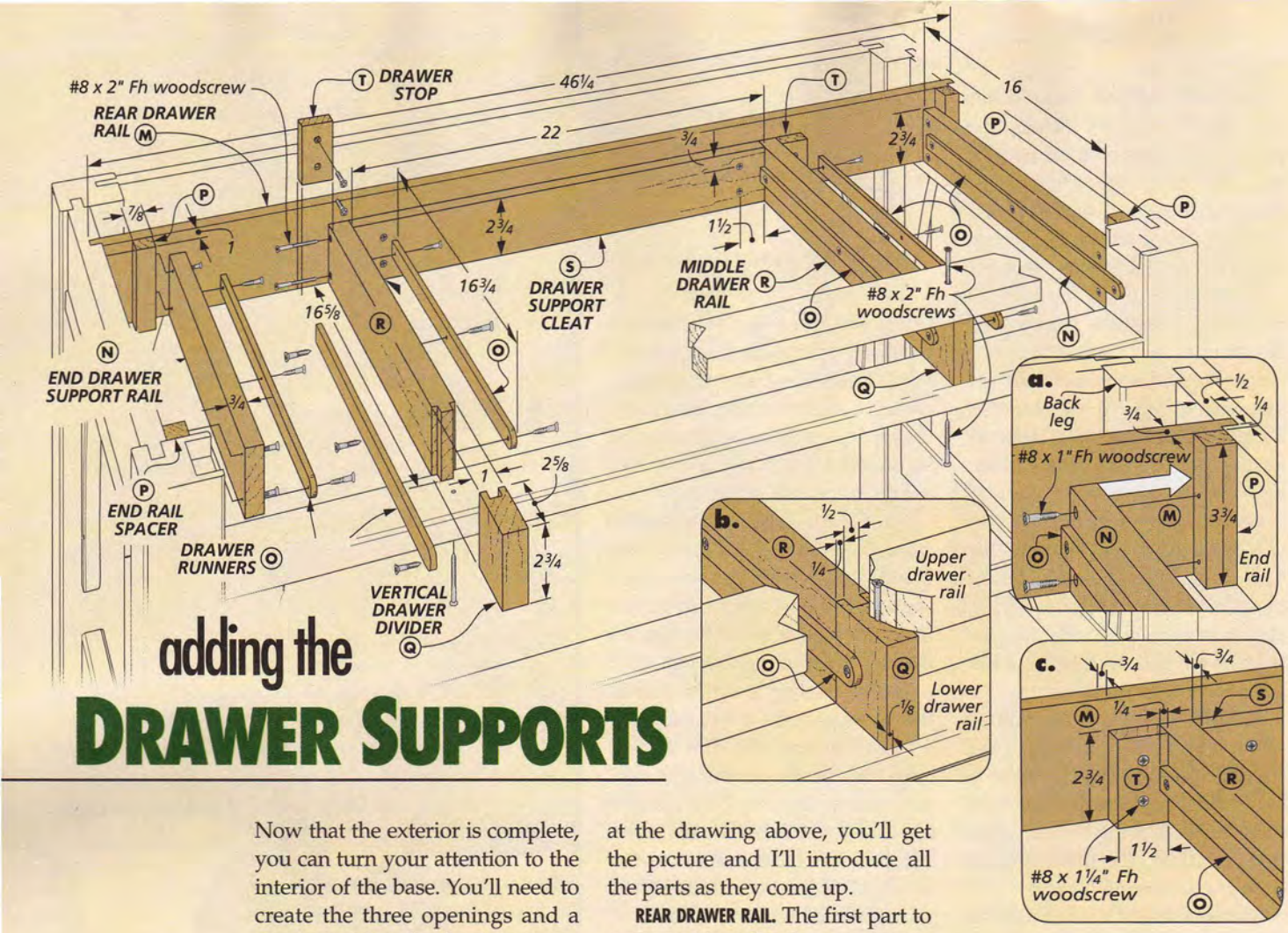


Flush Trim. *Finally, I secured the blank in the jig with double-sided tape and trimmed the rough edge using a pattern bit. Rout "downhill" starting at the wide end.*



Four Shoulders. *The lower drawer rail and stretcher need four-shouldered tenons. Cut the cheeks, then stand the pieces on edge to cut the shoulders.*

▲ False tenons create a traditional through-tenon look.



adding the DRAWER SUPPORTS

Now that the exterior is complete, you can turn your attention to the interior of the base. You'll need to create the three openings and a support system for the drawers.

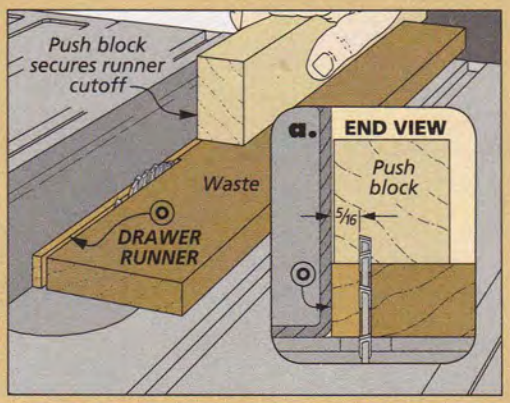
OVERVIEW. The partition/support system has a fair number of parts, but it's designed to go into the assembled base very easily. The side-mount drawers slide on thin runners installed on a sturdy, interior framework. No bottom support is needed. If you take a look at the drawing above, you'll get the picture and I'll introduce all the parts as they come up.

REAR DRAWER RAIL. The first part to make and install is the rear drawer rail. This piece stretches between the upper end rails to anchor the drawer support system. A short tongue cut on each end fits the dadoes you cut earlier in the end rails. You can simply apply glue to the tongues and then slide the rail into the dadoes from the top.

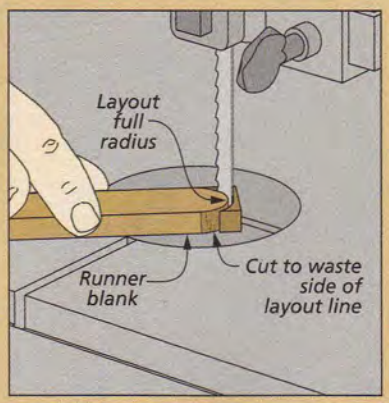
SUPPORT SYSTEM. With the long rail in place, you can start adding the drawer support rails and runners. You'll need to install a rail at each end and a middle assembly that forms the drawer openings.

I worked on the two end pieces first. These are simply cut to fit

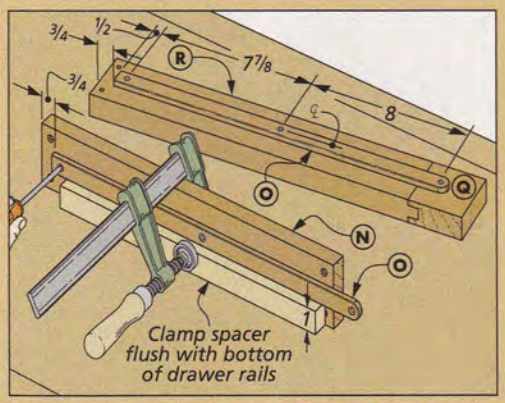
How To: Drawer Runner Details



Rip to Size. *To begin making the drawer runners, rip them to rough thickness from ¾" stock. Then plane them to ¼" thick.*



Round the Ends. *After cutting the runners to length, round one end at the band saw. Then sand it smooth.*



Attach the Runners. *A spacer clamped to the rail will help position the runner while you install screws through pre-drilled, countersunk holes.*

between the front leg and the rear support rail. They're attached by screwing them to spacers glued to the upper end rails (detail 'a' on the opposite page). They should sit flush to the inside edge of the leg.

RUNNERS FIRST. But before attaching the rails to the frame, I made the drawer runners and pre-installed them. This is much easier than trying to accurately position and screw them in place afterward.

The runners are ¼"-thick by ¾"-wide strips that are rounded on the front end. You'll need six in total, so I would make them all at once. The box at the bottom of the opposite page shows how to do the job. Note that the runners are positioned ¾" away from the back end of the rails. They'll lap onto the front legs so they can be screwed to them.

MIDDLE SUPPORTS. The middle rail assembly is a little different. Starting at the front, you have a pair of vertical dividers screwed between the drawer rails. The middle drawer rails are joined into the back edge of the dividers. Then a runner is attached to either side of this assembly (detail 'b,' opposite). The drawer rails are sized to butt up to the rear support rail and are held fast by screwing them to the ends of a support cleat. This cleat doubles as a drawer stop.

THE CONSTRUCTION. The nice thing about this design is that the whole thing can be preassembled and then added to the base. And I built it just as I described it, from front to back. The vertical dividers start out as an extra-long blank. This makes it easier to cut a groove in the back edge, as shown in the Shop Tip above. Once the groove is completed, you can cut two dividers to length.

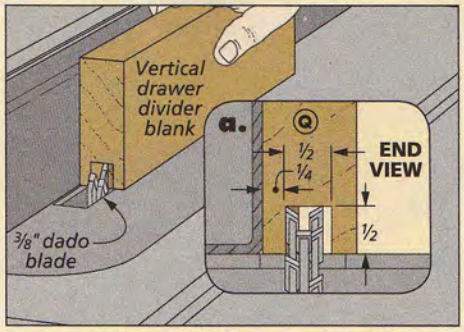
I cut the support rails to width, but left them extra long. Once a tongue is cut on the front end (drawing above), and the rail is glued to the divider, you can trim each assembly to final length. Just note that the dividers are recessed from the edges of the drawer rails.

Now, you can add a drawer runner to each side of the assemblies. Make sure to space the runner away from the rear end (details 'b' and 'c,' opposite). Finally, the support cleat can be cut to size and the assemblies screwed to either end.

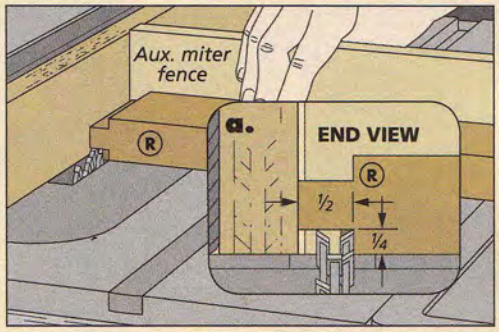
THE INSTALLATION. A look at the drawings below will help you understand the support installation. The key is to get it positioned correctly. The small drawer openings should be equal, with the rails square and aligned in the base. Take a few minutes to check, adjust and double-check before installing the screws in the vertical dividers and the support cleat.

There's one more task before moving on. The small drawer openings need stops. These are just small blocks that butt up to the middle drawer rails and are screwed to the rear support rail, as in detail 'c' on the opposite page.

Shop Tip: Centered Tongue & Groove

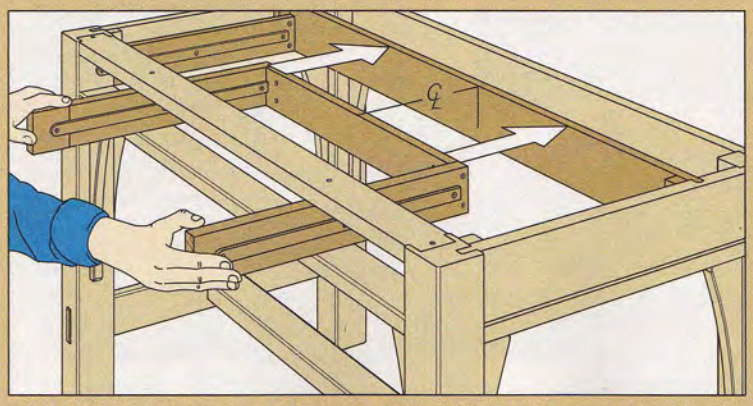


First, the Groove. *I used a dado blade to cut a centered groove on the divider blank. Flip the blank end for end between passes.*

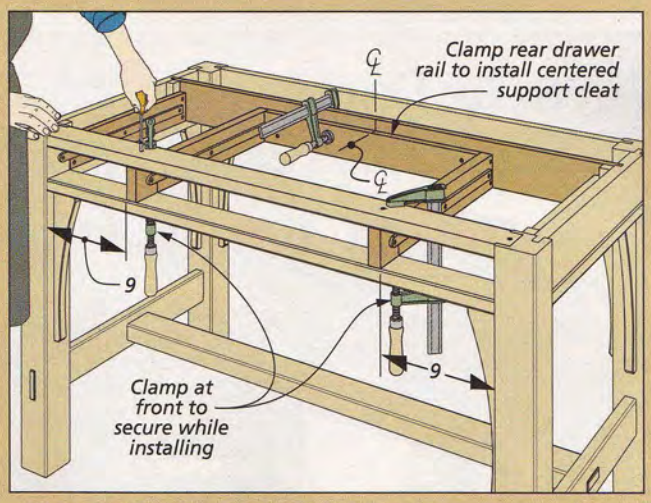


Next, the Tongue. *You can use the same dado blade to cut a mating tongue on the rails. The rip fence will gauge the length of the tongue.*

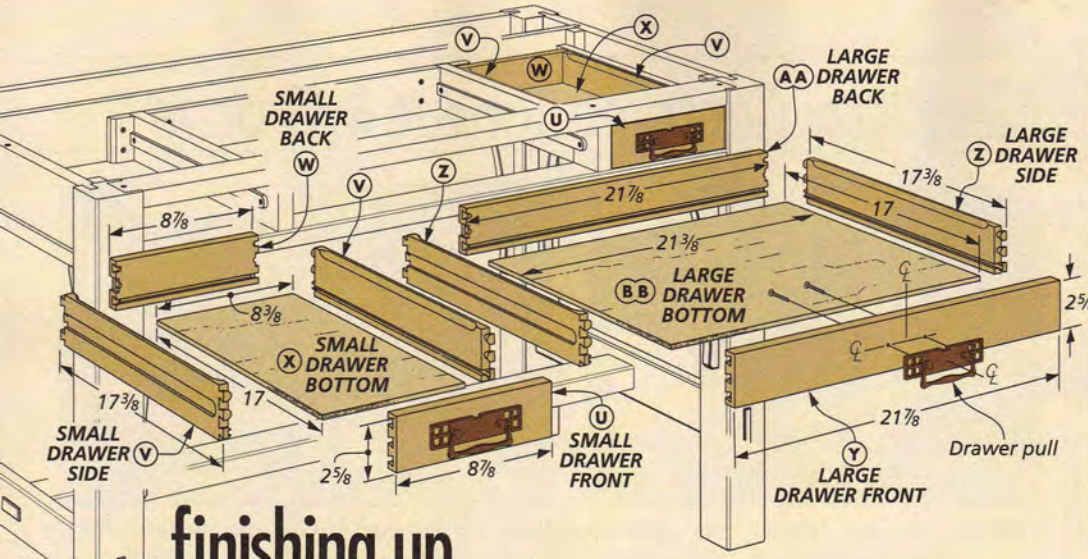
Install the Middle Support

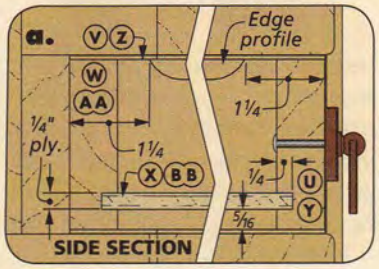


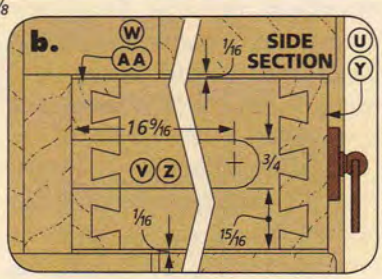
Slide It into the Base. *After attaching the two rail assemblies to the support cleat, the entire assembly can be inserted between the drawer rails and temporarily held in place with a clamp or two.*

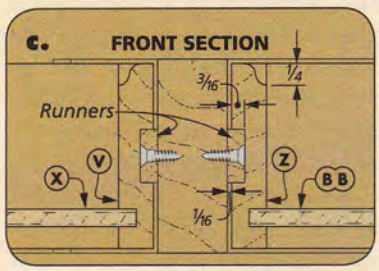


Adjust and Fasten. *Before installing the screws, you'll want to carefully adjust the position of the assembly and make sure the drawer openings are square and level.*

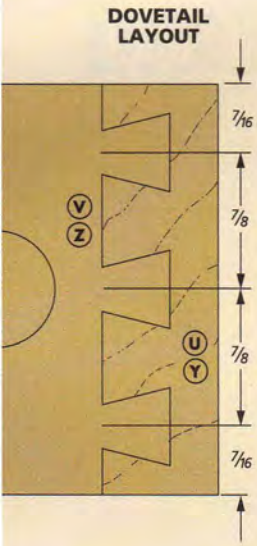








finishing up DRAWERS & TOP



With the base completed, you're down to a few important details. Making the three drawers and then the top will wrap things up.

THE DRAWERS. The drawers have three features that guide the work you'll do. First comes the half-blind dovetail joinery used to build the boxes. Second, I added an authentic period detail by routing a profile on the top inside edge of the drawer sides. And finally, you'll need to rout grooves in the sides to fit the runners in the base.

DOVETAILS. Before you can get started on the dovetail joinery, you'll need to cut all the parts to size. I sized the drawers to have a 1/16" gap on all sides and to sit flush with the vertical dividers.

Once the parts are ready, you can set up your jig and get to work on the dovetails. As shown at left, they're laid out with a standard spacing (⅞" on centers).

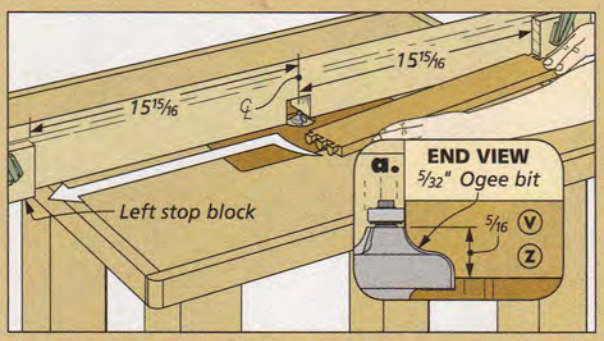
PROFILE. After cutting grooves for the plywood bottoms at the table saw, I took the sides to the router table to add the decorative profile.

The profile is routed using a small ogee bit and is "stopped" short of the ends. To do this, I set up the router table with stop blocks clamped to the fence, as shown below. This allows you to make the cuts without trying to rout to a line. You'll avoid the burning that often occurs during a slow cut.

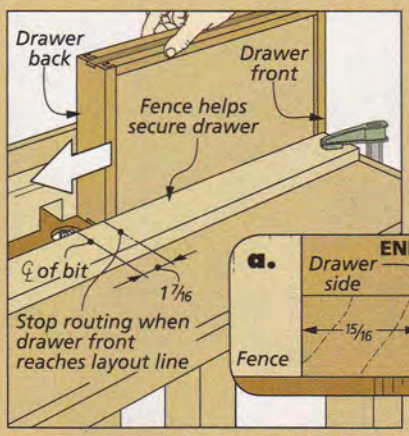
RUNNER GROOVES. After sanding the routed profiles, the drawers can be assembled and you can move on to the final step — routing runner grooves in the drawer sides.

I routed the stopped grooves with a single pass using a sharp ¾"-dia. straight bit. The goal is centered grooves that are consistently positioned from side to side. The second and third drawings in the box show the trick. I trapped the drawer between the fence and a straightedge and made the two cuts feeding in opposite directions. This way the cuts on both sides can be referenced from the top edge.

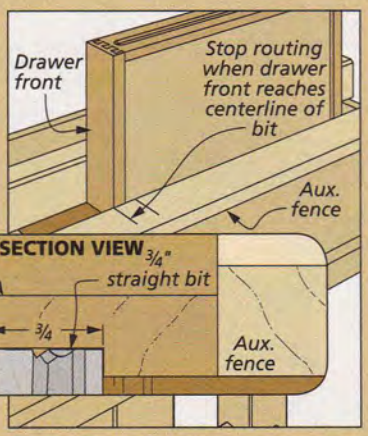
How-To: Drawer Details



Stopped Edge Profile. *To rout the stopped ogee profile, butt the drawer side up to right stop block, plunge into the bit and rout to the left stop block.*

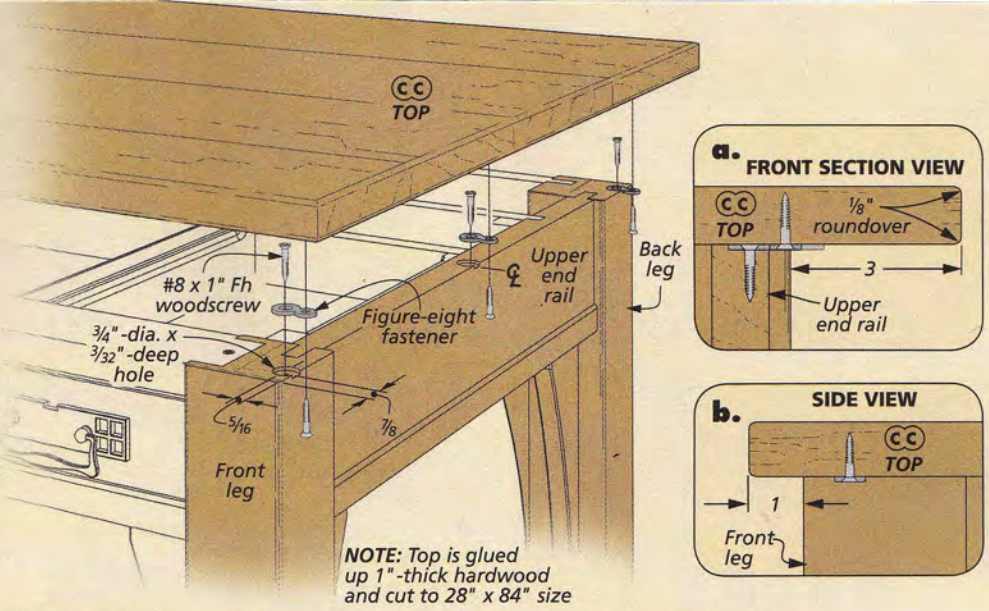


Routing the Grooves. *Feed in the usual right to left direction to rout the groove on one side.*



Opposite Direction. *To rout the groove on the opposite side, you'll need to feed from left to right.*

It's a good idea to rout a test piece to check the accuracy of the setup before routing the drawers. When the drawers are fit to your satisfaction, the pulls can be installed. And this leaves just one thing to do — make the top.



THE TOP

Adding the top is a relaxed way to finish up the table. You can start by gluing up an oversized panel from 1"-thick stock. Then take some time to clean up and smooth the top before cutting it to final size.

CUT TO SIZE. The heavy panel was too large for my table saw, so I took a different route. First, I cut it to rough size with a circular saw. Then I used a router, a straightedge and a flush-trim bit to trim it to finished size. Finally, I switched to a roundover bit to ease the edges.

THE LAST CHORE. Now you can install the top on the base. The inside of the base has limited access, so I mounted the top with figure-eight fasteners positioned around the perimeter, as shown above. I mortised one into the top of each leg and one in the center of each end rail (details 'a' and 'b'). The mortise is just a shallow hole drilled with a Forstner bit (main drawing).

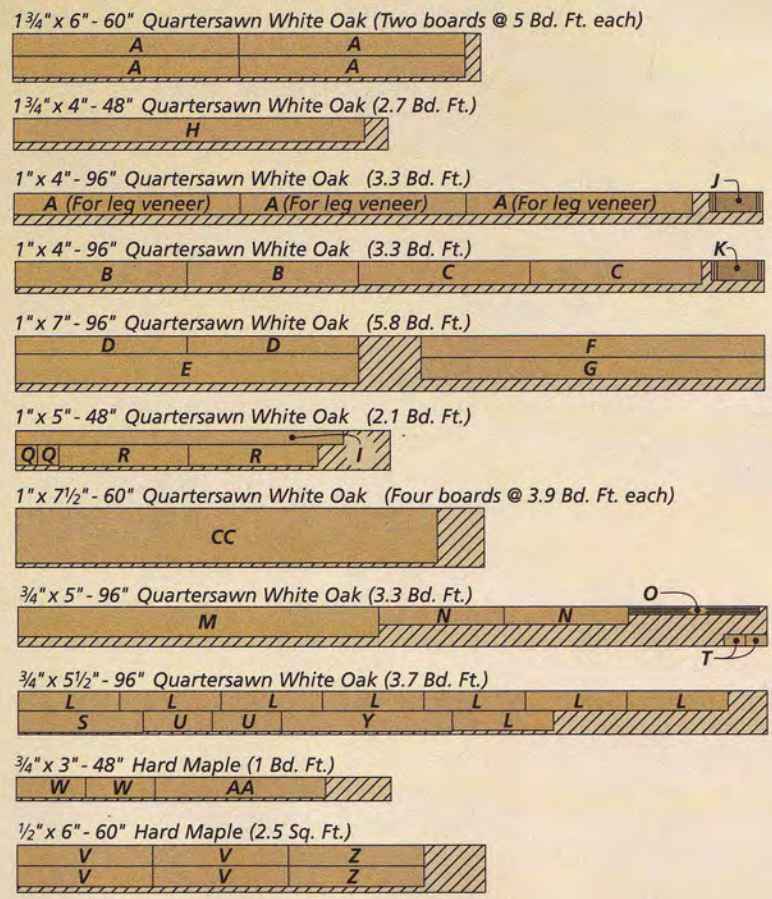
After screwing the fasteners to the legs, you can position the top on the base and mark for pilot holes. The top should be centered with a 3" overhang on each side and 1" overhang front and back.

Once the top is screwed down, you can take a short break and start thinking about a finish. I suggest a good, durable varnish. After all, your library table will be around for a long, long time. W

Materials, Supplies & Cutting Diagram

A	Legs (4)	3 x 3 - 29
B	Upper End Rails (2)	1 x 3¾ - 22
C	Lower End Rails (2)	1 x 3 - 22
D	End Ledgers (2)	1 x 2¼ - 20
E	Back Rail (1)	1 x 3¾ - 44
F	Back Ledger (1)	1 x 1¾ - 42
G	Upper Drawer Rail (1)	1 x 2¾ - 44
H	Lower Drawer Rail (1)	1 x 2¾ - 44
I	Stretcher (1)	1½ x 3 - 45
J	Leg False Tenons (4)	½ x 2½ - ⅜
K	Stretcher False Tenons (2)	¾ x 2¼ - ⅜
L	Corbels (8)	¾ x 2½ - 13
M	Rear Drawer Rail (1)	¾ x 3¾ - 46¼
N	End Drawer Support Rails (2)	¾ x 2¾ - 16
O	Drawer Runners (6)	¾ x ¼ - 16¾
P	End Rail Spacers (4)	1 x ⅞ - 3¾
Q	Vertical Drawer Dividers (2)	1 x 2⅝ - 2¾
R	Middle Drawer Rails (2)	1 x 2¾ - 16⅝
S	Drawer Support Cleat (1)	¾ x 2¾ - 22
T	Drawer Stops (2)	¾ x 1½ - 2¾
U	Small Drawer Fronts (2)	¾ x 2⅝ - 8⅞
V	Small Drawer Sides (4)	½ x 2⅝ - 17⅜
W	Small Drawer Backs (2)	¾ x 2⅝ - 8⅞
X	Small Drawer Bottoms (2)	¼ ply. - 17 x 8⅜
Y	Large Drawer Front (1)	¾ x 2⅝ - 21⅞
Z	Large Drawer Sides (2)	½ x 2⅝ - 17⅜
AA	Large Drawer Back (1)	¾ x 2⅝ - 21⅞
BB	Large Drawer Bottom (1)	¼ ply. - 17 x 21⅜
CC	Top (1)	1 x 28 - 54

- (14) #8 x 2" Fh Woodscrews
- (8) #8 x 1¼" Fh Woodscrews
- (18) #8 x 1" Fh Woodscrews
- (12) #8 x ⅝" Fh Woodscrews
- (3) Dark Bronze Bail Pulls w/Screws
- (6) Figure-Eight Fasteners



ALSO NEEDED: *One 24"x 48" sheet ¼" Maple plywood*

3 easy ways To Rip Thin Strips

When it comes to ripping thin strips, a sharp blade and an accurate setup are key.

Use a combination blade (left) or rip blade to cut thin strips.

It seems like every time I'm in the shop, I need a thin piece of wood for something. Either as edging, a shim, or a spacer. And sometimes I need several thin strips for a bent lamination project like the one in the article on page 16.

At first glance, ripping thin strips looks easy. You just set the rip fence, and push the workpiece through the blade. But if you haven't taken a few key steps first, you might not have a strip that's the same thickness from end to end.

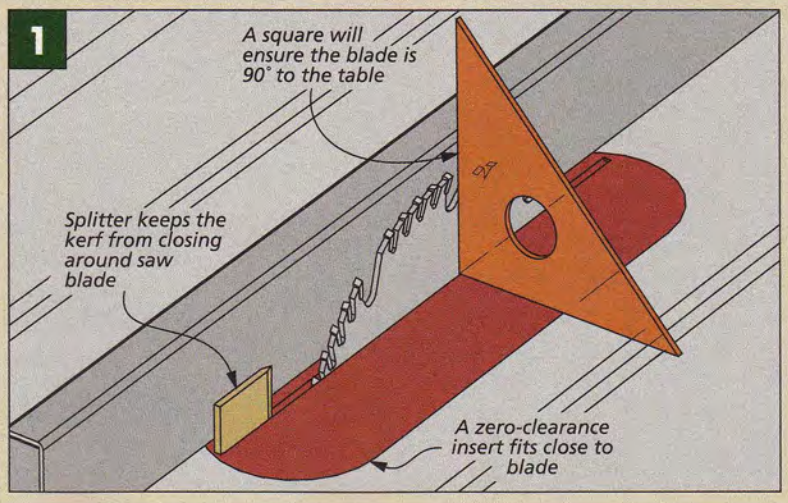
If this happens when you're ripping thin strips for bent lamination, you'll see gaps in the laminated workpiece. For this reason, getting a thin strip that's cut straight and smooth is essential.

There are several ways to ensure that thin strips come off the saw as identical pieces. And the most important step before you make a cut, is to set up your table saw for optimum performance.

SAW SETUP

Before I even turn on the table saw to rip thin strips, I give it a quick check-up. This way, I know I'm getting consistent cuts. For more tips on tuning up your table saw, see the article on page 42.

BLADE AND INSERT. The first step I take is to make sure I have a sharp combination or rip blade installed so that once the strips are cut I won't have to do a lot of sanding (left photo). Then I install a zero-clearance insert. This insert prevents the strip from getting wedged in the throat opening and kicking back when it's cut free.



You'll also want to add a splitter so that the strip doesn't pinch the back of the blade during the cut and kick back (Figure 1).

90° TO THE TABLE. There are just a couple more adjustments you'll want to check before you start ripping thin strips. Once the blade and insert are installed, I check that the blade is 90° to the table. This ensures uniform thickness at the top and bottom edges of the strips. Finally, I adjust the rip fence so that it's parallel to the blade.

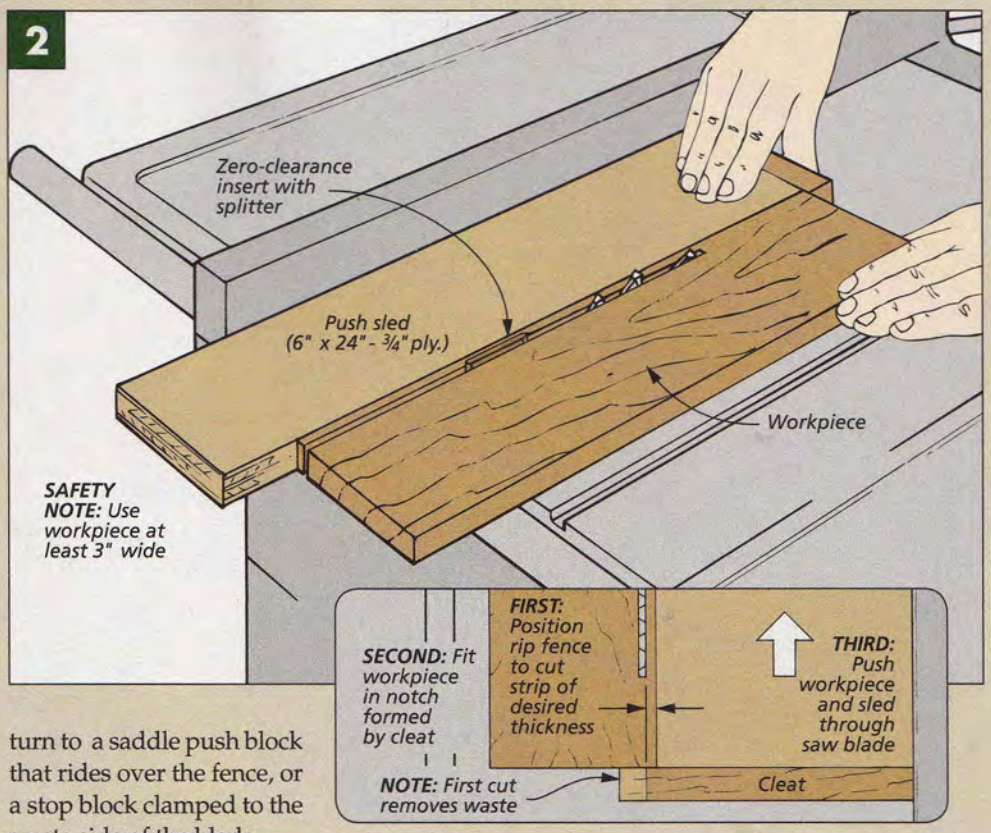
THREE OPTIONS

Now that you have your saw in top order, you can turn out perfect thin strips. And there are three ways to get the job done.

RIPPING SHORT STRIPS. One of the best ways to safely rip strips that are less than 30" long is to use a simple push sled that rides against the rip fence (Figure 2). It's just a piece of plywood with a hardwood cleat attached so it overhangs the edge. The workpiece fits into the notch formed by the cleat. Once you have the rip fence positioned to the width of the sled plus the thickness of the thin strip, just slide the sled and the workpiece through the saw blade.

LONG THIN STRIPS

The sled works great for shorter boards. But if you have longer strips to cut, like the ones for the box handle on page 16, you'll need a different setup. That's when I turn to a saddle push block that rides over the fence, or a stop block clamped to the waste side of the blade.



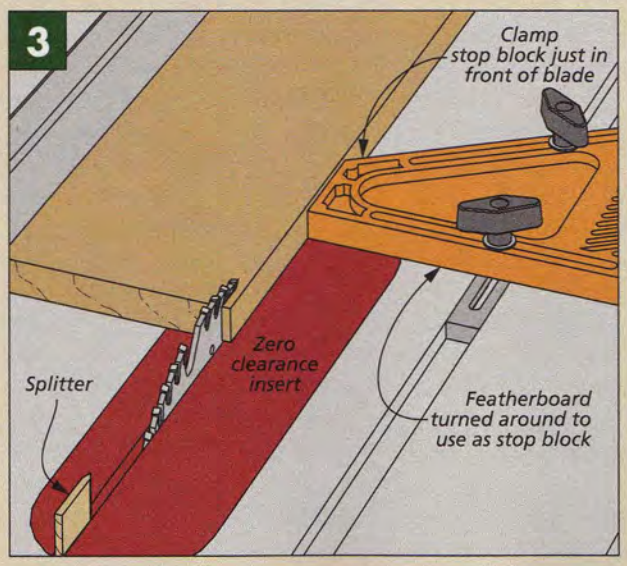
STOP BLOCK. If you prefer to have the strips come off the waste side of the blade, you can use a stop block as shown in Figure 3. A wood block and a couple of clamps will work. But some featherboards can be turned around and mounted in the miter slot as well.

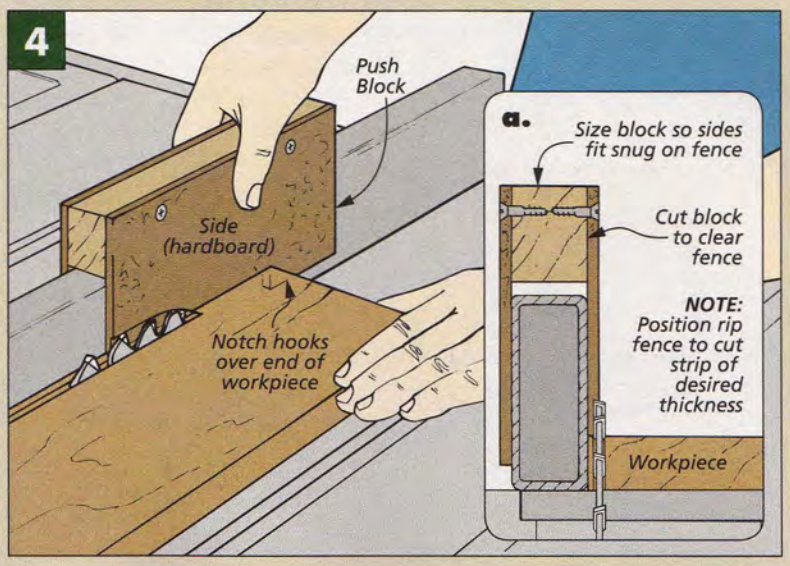
I clamp the block just in front of the blade at a distance that matches the thickness of the strip. You'll have to move your fence for each cut. Just move it until the workpiece butts against the stop block without binding the fence.

PUSH BLOCK. If you don't want to move the fence each time you make a cut, then the saddle push block is a better option (Figure 4).

This is just a block the same width as your rip fence with a piece of 1/4" hardboard attached to each edge. One side of the block has a notch cut in it. The block straddles the fence as you push the workpiece through the saw blade.

So the next time a project calls for thin strips, turn to one of these methods. You'll get consistent strips ready for glueup. W





7-step Table Saw Tune-Up

To keep your table saw cutting smooth, straight, and square, it pays to set aside a little time for a tune-up.

Solvents and brushes are the tools of choice for removing built-up pitch and resin.

In most shops, the table saw is the center of activity and the tool that is used the most on just about every project. Whether it's cutting sheet goods, ripping hardwood boards to size, or cutting precision miter joints, the table saw is a reliable woodshop workhorse.

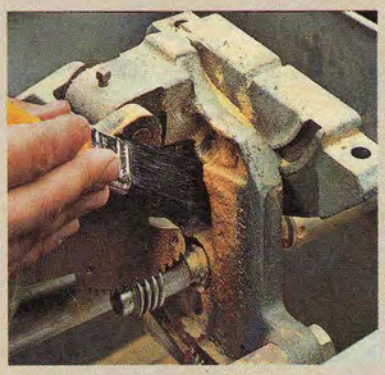
So it's easy to take your saw's performance for granted. After all, its cast iron top and rugged interior don't appear to need a lot of delicate care. But to keep it cutting reliably and safely, it's a good idea once or twice a year to devote an afternoon to the routine maintenance and adjustments it requires.

The good news is, you don't have to be an engineer to bring your saw's performance up to peak efficiency. The following operations are pretty straightforward and will keep your saw working at its best.

Before getting started though, I begin by pulling out my owner's manual. Your manual may or may not cover the maintenance procedures in depth, but it should at least help you find the parts that need adjustment and offer advice on the wrench sizes or other tools needed for the tune-up. Whenever they're listed, I make sure to set them out on the bench for easy access.

1 Basic Cleaning

Before you start adjusting and tuning your saw, you'll find it's helpful to begin with a thorough cleaning. Not only does this make it easier to access the parts, but it will give you a chance to look for broken or damaged components.



▲ A paint brush works great for getting into the tough-to-reach parts of your saw.

I usually begin by vacuuming the saw inside and out, reaching as far in as I can to clean up the gears. The brush attachment of a shop vacuum takes care of most of the surface dust and debris. But it will only get you so far.

For the harder-to-reach areas, a paint brush works well (left photo). Compressed air helps clear out the dust the brush dislodges from the crevices. If the dirt is really stubborn, a little solvent on the tip of the brush will loosen and dissolve pitch and resin. This is also a good time to lubricate the gears. I prefer to use wax or a dry lubricant so sawdust won't stick to it.

▲ Gears can become stubborn and hard to turn if the teeth are filled with sawdust, pitch, and resin. The stiff bristles of a toothbrush clean them out in a hurry.

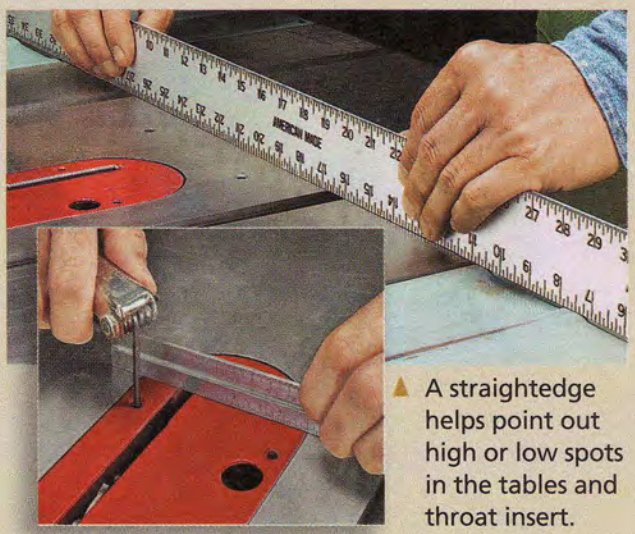
2 Be on the Level

In order to make square cuts, your saw's worksurface needs to be perfectly flat. If one of the extension wings is higher than the main table, a workpiece will not be level during a cut. This can make it difficult to get flush-fitting joints.

You can check the wings by laying a long straightedge across the table, as shown in the photo at right. On most saws, all you need to do is loosen a couple of bolts on the extensions to make the necessary adjustments. Make sure to check the fit at both the front and back of the saw table.

The throat insert also needs to be flush with the surface or a workpiece may catch the edge or rock during a cut. In either case, it can be a safety issue and will certainly result in less than perfect cuts.

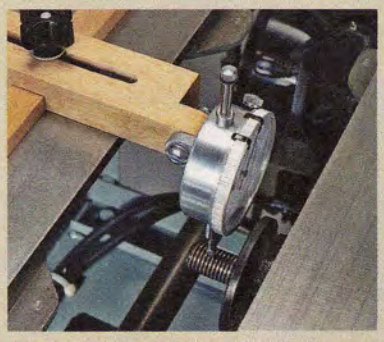
Most inserts have leveling screws that you adjust with an Allen wrench. You can use a metal ruler to check for gaps. Then, just adjust one screw at a time until the insert is level with the surface.



▲ A straightedge helps point out high or low spots in the tables and throat insert.

3 Check For Runout

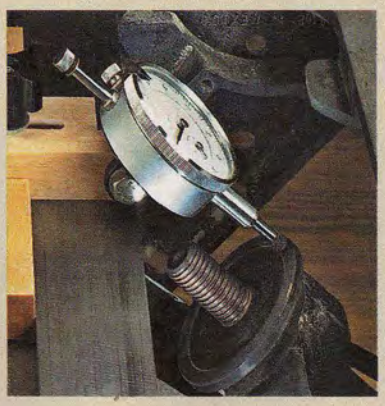
In a perfect world, the blade on your table saw would turn without any side-to-side movement. In reality, there's usually deviation caused by the arbor or flange not being perfectly straight or flat. This condition, known as runout, reduces the quality of the cut.



▲ A flat tip on the dial indicator spans the threads of the arbor for an accurate reading.

The best way to check for runout is to measure the arbor and flange with a dial indicator. I use a shop-made holder for both jobs, as shown in the photos. A dial indicator is inexpensive and accurate. Sources, on page 51, lists some places you can find them. You can find a plan for the holder on page 45.

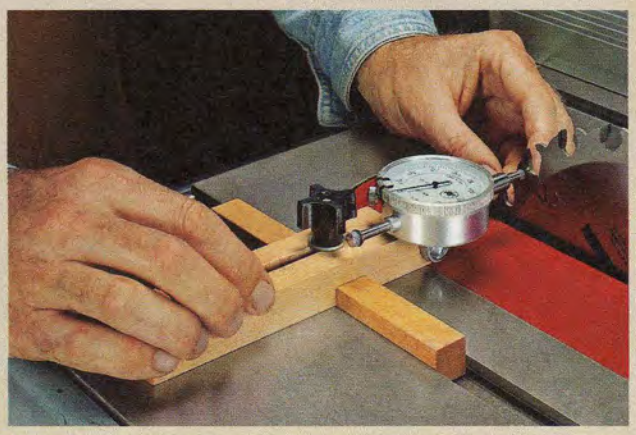
The photos show how to measure for runout on the arbor and flange. With the indicator in position, turn the arbor by hand, watching the needle for movement. Ideally, I like to see runout under .005". If you're getting more than that (and certainly if it's in the .010" range), you may have a more serious problem, like bad bearings or a bent arbor.



◄ To measure the flange for runout, tilt the arbor and keep the indicator perpendicular to the face to ensure an accurate reading.

4 Align Blade & Miter Slot

After checking the arbor, the next thing is make sure the blade and miter slot are parallel. You'll use the dial indicator for this, too.

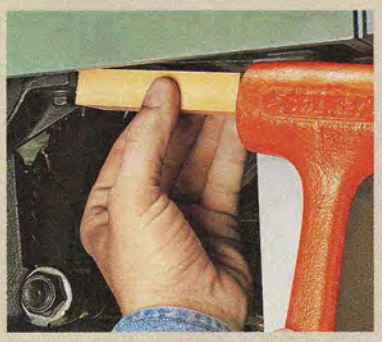


▲ A dial indicator can measure the distance to the blade at two positions, helping you determine if the blade is parallel to the miter slot.

You can start by making a reference mark on the blade. By measuring only at this mark, you avoid any surface imperfections on the blade and are assured of getting a more accurate reading.

Next, place the dial holder in the miter slot, as shown in the photo at left, and slide the indicator into position. For the first measurement, place the marked spot on the blade toward the front of the saw and position the tip of the indicator so it's touching the mark on the blade. By zeroing out the indicator in this position, you establish the baseline measurement.

Then rotate the blade toward the back of the saw and slide the indicator back to again touch the mark on the blade. If the dial doesn't move, then your saw is aligned.



▲ On a contractor's saw, aligning the blade and miter slot means adjusting the trunnions.

If it does move, make note of how much. You can usually correct the problem by adjusting the trunnions of a contractor-type saw. For a cabinet saw, the adjustment probably involves adjusting the position of the table. You'll need to refer to your owner's manual for the correct procedure for your saw.

5 Align the Pulleys

Another potential source of problems is the alignment of the motor and arbor pulleys. If they're not both turning in the same plane, the drive belt can deflect slightly and cause significant vibration in the saw. Fortunately, this is pretty easy to check and correct.

Using a straightedge, you can determine if the pulleys are aligned by resting it on the outside faces of both pulleys. (If you don't have a long enough straightedge, you can use a narrow piece of wood, as shown in the photo at right.)

If the straightedge rests flat on both pulleys, they're in good shape. If there's a gap, you'll need to shift the position of one of the pulleys on the shaft. Usually it's just a matter of loosening the pulley's Allen screw and sliding it into position.

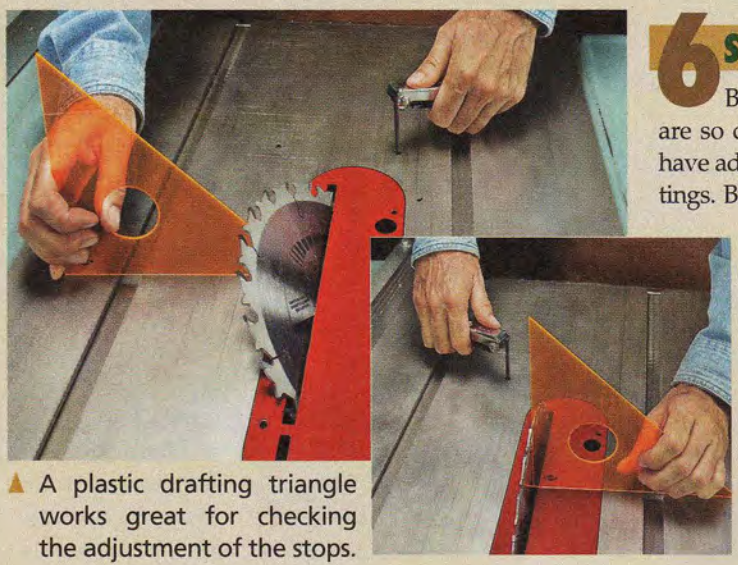
If you still have vibration, you might want to consider replacing the standard "V"-type drive belt that came with your saw with a link belt. Another option that often eliminates vibration is to replace the factory-installed, cast pulleys with machined replacements.

▲ Use a straightedge resting on the face of the motor and arbor pulleys to check that they're aligned.

6 Set the Stops

Because cuts at 45° and 90° are so common, most table saws have adjustable stops for these settings. But through repeated movements, they can be bumped out of alignment.

Manufacturers use different methods of adjustment, so you'll need to consult your owner's manual for specific instructions. On the saw in the photos, this is done by adjusting set screws in the top of the saw.



▲ A plastic drafting triangle works great for checking the adjustment of the stops.

To check the stops, start by raising the blade to full height. Then, use a square or a drafting triangle as shown in the photos at left, to set the blade to 90°. Now just set the stop to match.

To confirm the setting, tilt the saw blade a few times and return it to the 90° setting. Measure each time to verify the stop's accuracy.

When you're satisfied with the results, tilt the blade to 45° and set this stop. After you've completed this procedure, you'll be able to rely on the stops.

7 Miter Gauge & Rip Fence

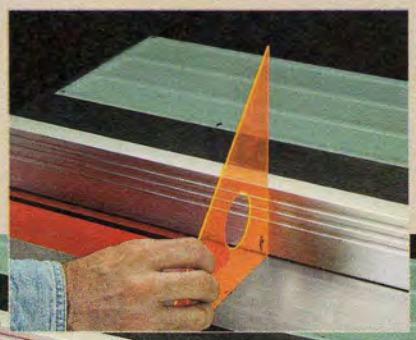
With the adjustments to the saw complete, it's time to turn your attention to the accessories you'll use to make virtually every cut — the rip fence and miter gauge.

I start by squaring the miter gauge to the blade. This is an effective method since you've already aligned the blade to the miter slot. Using a drafting triangle against the plate of the blade (be sure it's not touching a tooth), loosen the miter gauge and set it to match the square side of the triangle, as shown in the photo below.

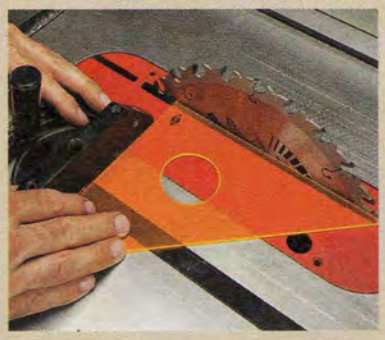
There are two schools of thought regarding the alignment of the rip fence. Most recommendations suggest setting the fence parallel to the blade. But some woodworkers prefer to have it angled slightly away from the blade so the fence doesn't push the workpiece against the blade and cause kickback. If you choose to add a slight angle to the fence, it shouldn't exceed .003".

It's very important that the fence never be angled *toward* the blade, or kickback could result. You can measure the fence with the dial indicator (center photo below).

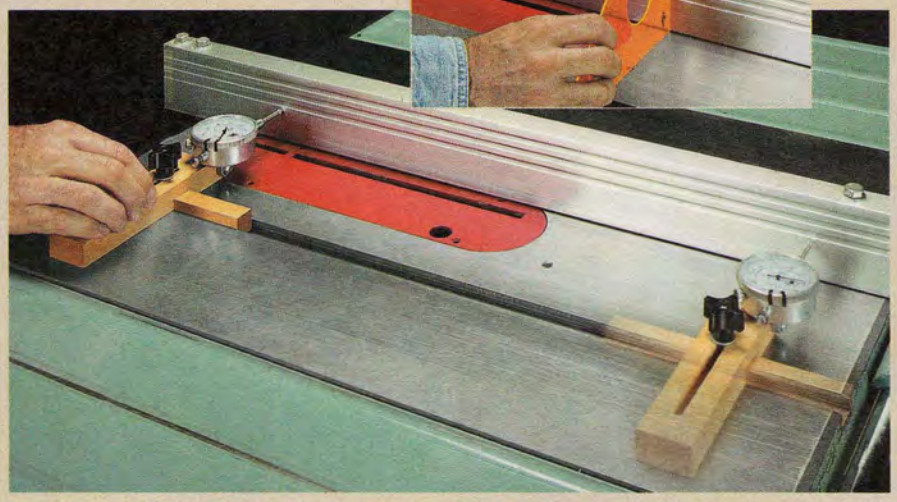
Finally, check to make sure that the fence is square to the table. You won't need to adjust this very often, but it's still worth taking a minute to check. Then your saw will be ready for the next project. W



◄ Check the fence to ensure it's square to the top of the table.



▲ To align the miter gauge, keep the drafting triangle on the plate, not the teeth.



▲ Use the dial indicator to determine if the fence is parallel to the miter slot (and blade). Take readings all along the length of the fence and adjust it according to the instructions in your owner's manual.

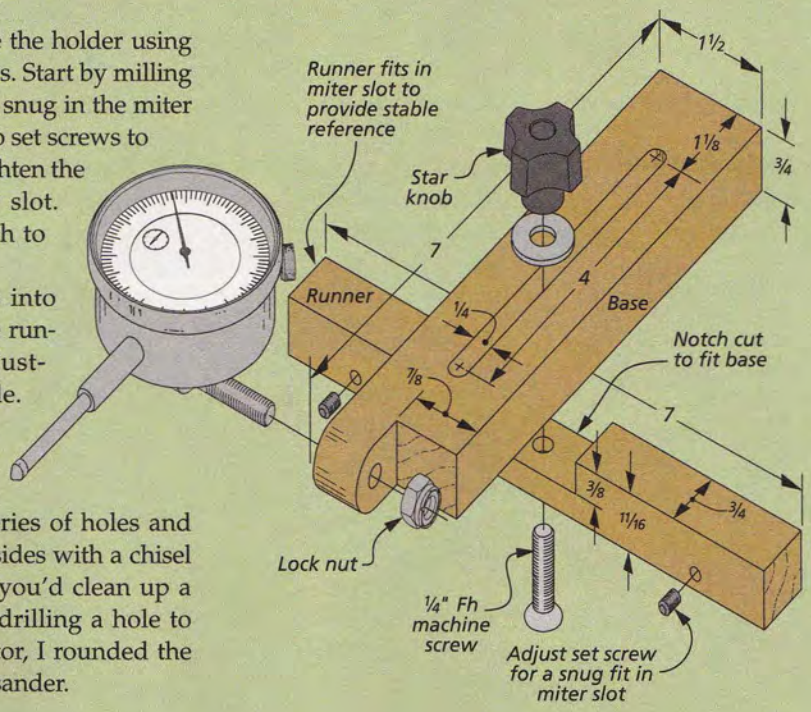
How-To: Shop-Made Dial Indicator Holder

A dial indicator is the perfect tool for measuring very small differences in alignment. It's an extremely sensitive and accurate device. But before you can use one, you'll need a way to mount the indicator so you can move it to measure different points, but still maintain an accurate reference. The sliding holder shown in the drawing at right does just that.

A hardwood runner fits tightly into the miter slot of your table saw to guarantee a stable position. The sliding base that holds the indicator is easily adjustable to allow you to move the tip so it can contact the blade or arbor to take the measurement. Finally, the rounded end of the base allows you to pivot the indicator to any angle.

You can make the holder using hardwood scraps. Start by milling the runner to fit snug in the miter slot. I added two set screws to the runner to tighten the fit in the miter slot. Then cut a notch to house the base.

The base fits into the dado on the runner and is adjustable side to side. To cut the slot for the screw and knob, I just drilled a series of holes and cleaned up the sides with a chisel (the same way you'd clean up a mortise). After drilling a hole to hold the indicator, I rounded the end with a belt sander.



Achieving a high-gloss finish is easy with the right technique.

understanding Grain Fillers

If you really want your projects to have an eye-catching finish, the first step is to fill the pores in the wood to smooth the surface.

No matter how much time and effort you put into the joinery and other details of your woodworking projects, the first thing most people notice is the finish. This is especially true when it comes to large, flat surfaces like tabletops. With light hitting the surface from different angles, the texture of the wood becomes very noticeable and every flaw is revealed. That's why a smooth finish — whether high-gloss or flat — is a necessary detail for those projects.

DEALING WITH WOOD GRAIN. But getting a smooth finish on wood can be a real challenge. No amount of planing, scraping, and sanding can change the fact that wood is a porous material.

So the first step to create a smooth finish is to fill the pores. On tight-grained woods like maple and cherry, you can usually do this simply by building up a few layers of finish and sanding between coats to level the surface.

Open-grained woods like oak, mahogany, and walnut have much larger (and deeper) voids. That makes them difficult to fill using finish alone. For these woods, I turn to a paste wood filler.

WHAT ARE THEY? As you can see in the photo at left, the products used for filling the pores can be called either "grain fillers" or "paste wood fillers," depending on the manufacturer. And like finishes, they can be either oil or water based. But regardless of the name, these products all contain three basic ingredients: a binder, a bulking agent, and a solvent.

The binder is just a finish. In the case of oil-based fillers it's usually an oil/varnish blend. For the water-based fillers, the binder is an acrylic or urethane finish.

Silica is used as the bulking agent for both kinds of grain fillers. Although silica sounds like a strange choice, it's used because of its stability. Silica won't shrink or swell with seasonal changes in temperature or humidity.

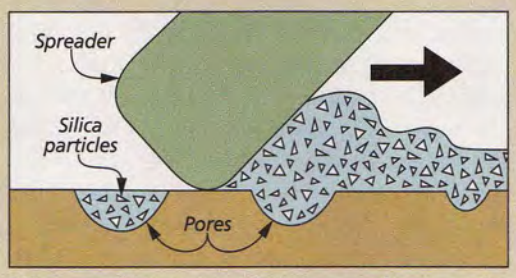
Finally, a solvent is added to act as a carrier for the mix. Oil-based fillers usually rely on mineral spirits and of course, water-based products use water.

CHOOSING A FILLER. There are two things to consider before selecting a filler. First, I'd recommend water-based products only if you intend to use a water-based finish. They're difficult to work with because they dry very quickly.

▼ Grain fillers go by different names and can be either oil or water based.

The second thing to think about is the color of the filler. Most manufacturers offer a "natural" color, that can be used on any wood. There are also shaded fillers for specific applications. In the main photo on the opposite page you can see a colored filler that I like to use with mahogany. Since there are no standards for these colors, though, you'll want to sample them before committing to a project.

MAKE TEST PIECES. As with any finishing technique, it's a good idea to experiment with grain fillers to find the look you want for your project. Cut-offs from the same wood you're using in the project work well. You can apply filler before or after staining to get the result you're looking for. For example, a light filler after a dark stain will make the pores more pronounced. A few test pieces will also help you perfect your technique.



Silica particles suspended in a solvent and a binder are forced into the pores.

APPLICATION TECHNIQUE

The first step in filling the surface is to sand the workpiece to 220 grit. Then clean the dust out of the pores using either a shop vacuum or compressed air.

With the workpiece prepared, you're ready to fill the grain. The box at the bottom of the page shows the basic steps for application. But before you begin, you'll need to check the consistency of the filler.

THIN THE FILLER. Most fillers are a little too thick to apply straight from the can, so you'll probably need to thin them using the appropriate solvent. For the oil-based fillers, mineral spirits will work fine. I add thinner until the mixture is about the same consistency as paint.

INITIAL APPLICATION. Now you can apply a coat of filler with a foam brush. The key here is to work only a small area at a time and push the filler into the pores. Brush both with and across the grain. You don't have to worry about overlapping sections. The filler will blend as you move through the steps.

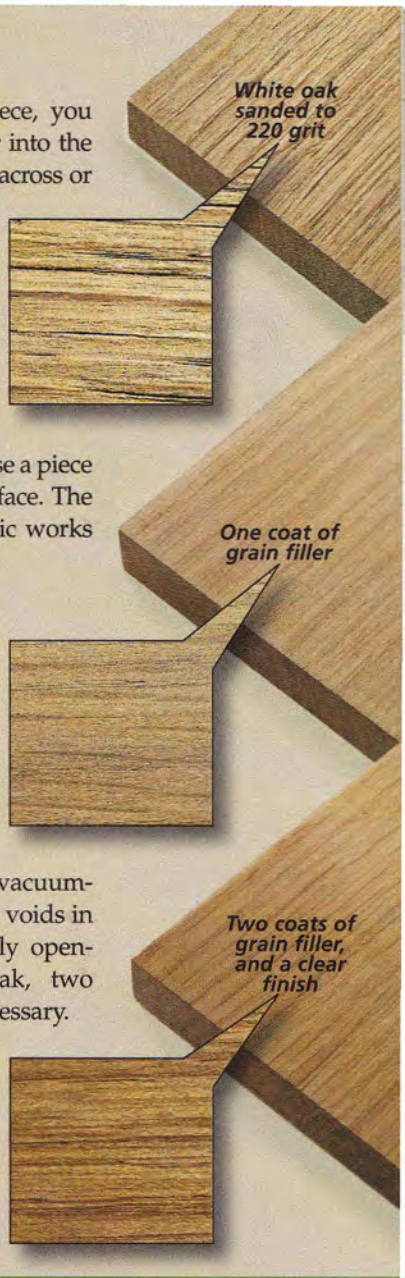
SQUEEGEE. After about ten minutes, use a plastic spreader to remove the excess. By holding the spreader about 45° to the workpiece, you can further force the filler into the pores. For this step, work across or at a slight angle to the grain. If you move with the grain you could pull the filler out of the pores. Reapply the excess to the surface until you have a smooth coat.

RUB WITH BURLAP. When the filler dries to a haze, use a piece of burlap to clean the surface. The coarse texture of the fabric works great to smooth the filler.

LET IT CURE. You'll need to let the filler cure completely. This can take two or three days depending on the temperature and humidity.

SAND AND FINISH. A light hand sanding with 220-grit paper will result in a smooth surface. After vacuuming off the dust, check for voids in the surface. For extremely open-grained woods, like oak, two applications might be necessary.

When you're happy with the result, just apply a clear finish. Once you see the light hit the smooth finish on your project, you'll know it was worth the effort. W



How-To: Apply Paste Wood Filler

▲ **Brush On.** Apply the filler by brushing both with and across the grain to work it into the pores.

▲ **Wipe Off.** After a few minutes, use a plastic spreader to remove the excess, pulling it across the grain.

▲ **Burlap Buff.** When the filler dries, rub across the grain with a piece of burlap to smooth the surface.

adding the Perfect Pulls

Choosing and installing pulls that bring out the best in a project just takes a little thought and planning.

Sometimes, when designing and building a project, the seemingly simple decisions can be the ones that need a little extra thought. This is the case when choosing and installing drawer and door pulls. There are hundreds, maybe thousands, of pulls available. You have to decide which ones will give you the best appearance and how to position them. But all it really takes to add pulls that blend perfectly into a project is a little planning and some "design sense."

MAKING THE CHOICE

What are the things you need to think about when selecting pulls? For me, there are a couple of considerations. First, I try to match the style of the pull to the project. Second, I make certain the size and proportions are a good fit both aesthetically and functionally.

THE RIGHT LOOK. When planning a project, I look for pulls that add to the appearance in a subtle way, not become the focal point. The main drawing above and the drawings below show some good examples.

Many styles of furniture have matching styles of pulls that work with the design. Notice above how the complex contours of the bail pulls mimic the curves and detail of the Queen-Anne Lowboy.

The same can be said for the pulls on the Craftsman-style sideboard shown below at left. Here, the simple curves of the pulls complement and add a touch of detail to the Craftsman lines.

Shaker-inspired furniture looks best with turned wood pulls (see the chest on the following page). An ornate metal pull would look out of place and distracting.

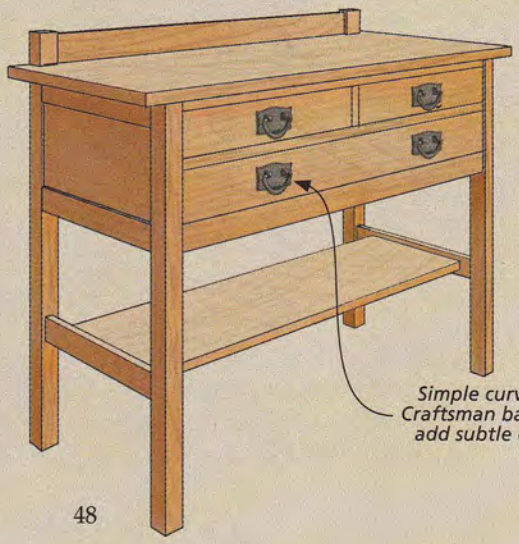
SIZE AND PROPORTION. Pulls that are out of scale (too large, too small, or the wrong shape) can detract from the appearance of a project and may not work well. The three-drawer coffee table shown below at right is a great example of how pulls can "fit" a project. The long, narrow cup pulls are the perfect complement to wide drawers. And this practical style makes opening and closing the large drawers nearly effortless.

PLACEMENT

Choosing appropriate pulls is a good first step. Now the goal is to position them on the project in a way that's both functional and aesthetically pleasing.

DRAWERS. First, lets look at drawers. Here, there are no hard and fast rules for placement of pulls, but you can rely on some guidelines. The chest of drawers opposite illustrates some of these points.

ONE OR TWO. One of the first questions you need to answer is one pull or two? The size of the drawer, mainly the width, is usually the determining factor. Up to about



Simple curves of Craftsman bail pulls add subtle detail

Long, narrow cup pulls are both functional and in perfect scale to drawers

16" to 18" wide, you can generally get by with a single pull. A drawer of this width can be opened pulling from the center without racking from side-to-side.

The exception might be a drawer that is very shallow in depth. In this case, two pulls will may work better and allow the drawer to be opened without binding.

Wider drawers usually need two pulls, as shown below. Two pulls will give you a better grip and allow you to keep the drawer from racking as you open it. And two knobs also create a much better visual balance on a wide drawer.

LOCATION, LOCATION. It may seem obvious, but the location of the pull or pulls on a drawer also takes some serious consideration. A drawer with only one pull is pretty cut and dried. Center the pull side-to-side and top-to-bottom.

When installing two pulls, the rule of thumb is to divide the width of the drawer into four equal sections. Then place the pulls at the one-quarter and three-quarter marks. You can shift them slightly to achieve the best balance.

WHERE IS THE CENTER? The pulls on a drawer are almost always centered from top to bottom. But determining the centerpoint on some pulls can be confusing. A couple of different examples are shown in Figures 1 and 2 below.

In Figure 1, the overall height of the bail pull is centered on the height of the drawer. In the second example, I used the width of the backplate to center the pull. Both installations look appropriate.

STACKED DRAWERS. It's common for a chest to have two (or three) narrow drawers stacked over wide drawers — the narrow drawers having one pull and the wide drawers two. You can see at right how the symmetry is maintained by lining up the pulls vertically.

DOORS

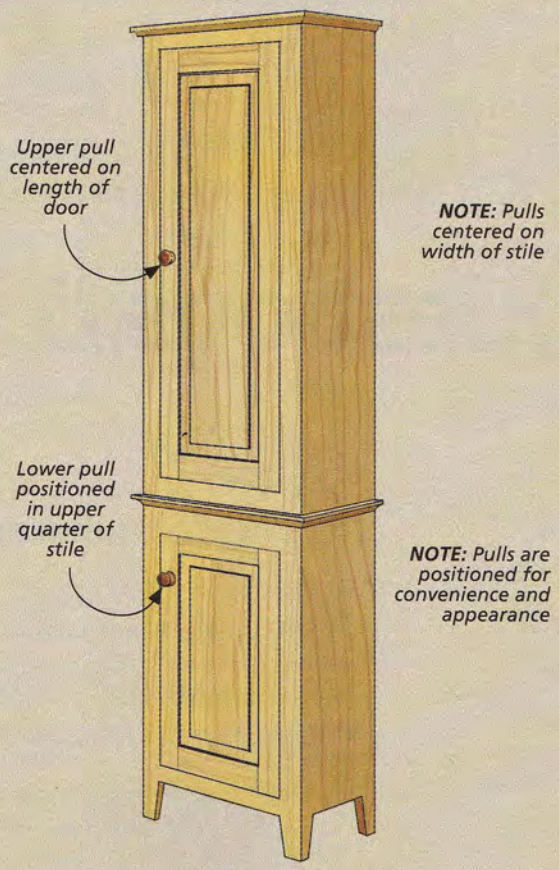
When positioning the pulls on doors, the vertical dimension is most critical. The trick is to properly place the pulls along the door stiles. The question is where?

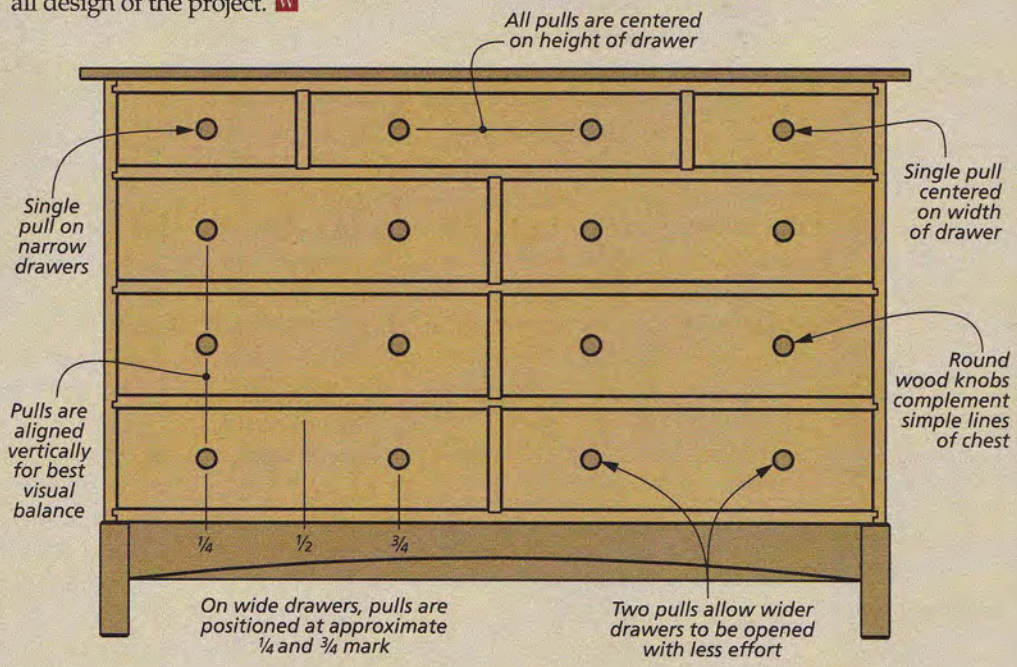
A main consideration is convenience. The pull needs to be within easy reach and allow you to open a door without too much effort.

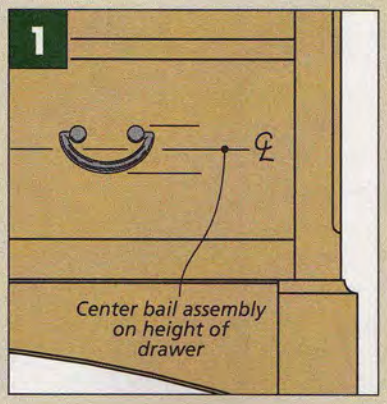
The drawing at right shows a good arrangement. On a lower door, I like to place the pull on the upper one-quarter of the stile. This looks the best and eliminates stooping to reach the pull.

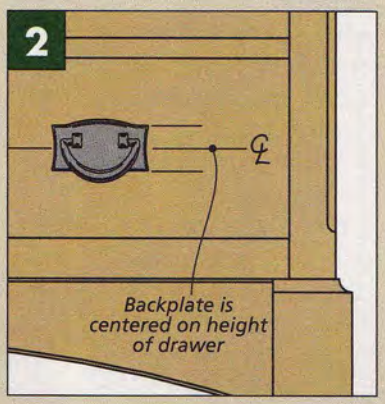
The placement of a pull on an upper door can depend on its height above the floor. The pull works best if placed at approximately chest level or lower. For the best visual effect, I like to center the pull on the length of the door. But on a very "high" upper door, you may want to position it near the lower end of the stile.

I'll finish up with a last piece of advice. Try not to procrastinate on your choice of pulls. Making this decision up front allows you to incorporate the pulls into the overall design of the project. W









Questions & Answers

Child-Safe Finishes

Q ***I'm making a pull toy with blocks for a 2-year-old child. What type of finish would be safe to use on the toy?***

Dave Turner
Waterloo, Iowa

A There are a variety of finishes that are labeled as child safe or food safe. These are primarily natural oil finishes, like mineral oil and walnut oil.

OILS. Mineral oil is sold as butcher-block oil or salad bowl finish. It's available at pharmacies and groceries in the health aisle, as well as woodworking stores. This oil dries completely over time, but even if it's not completely dry when the project is used, it has no ill effects if ingested in small quantities.

A lesser known alternative to mineral oil is walnut oil (left photo), a natural drying oil. Walnut oil is sold as a food product, but it is also available from woodworking suppliers.

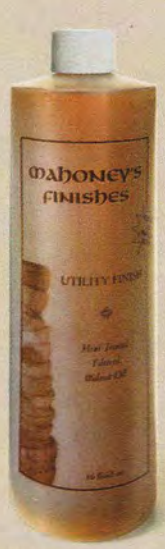
The type of walnut oil sold for woodworking is usually polymerized, which means it's heated so that the oil will dry more quickly. Walnut oil usually doesn't contain any solvents or driers.

But not all oils are created equally. Many finishing products packaged with the name oil, contain solvents and driers that may be harmful. These products include Danish oil, teak oil, boiled linseed oil, and some others. If you want to stay away from any products with solvents, read the label to make sure there are none in the oil you choose.

HARD FINISHES. But the reality is that all finishes are safe after they've cured. What makes most finishes toxic in their liquid form are the ingredients added to decrease drying time and provide a vehicle for the hard resins in the finish.

Once the finish is cured (after about 30 days), the solvents and driers have evaporated out. The resins left behind are safe.

For example, shellac is used frequently as a finish on furniture. But it's actually safe enough that it's used in some foods and medications. Polymer resins, which are the main ingredient in polyurethanes, are not harmful either.



▲ Walnut oil is a natural drying oil and is sold as a food-safe finish.

PAINT. Paint, whether it's oil-based or acrylic, is a safe finish to put on children's toys, too. Paint sold in the United States doesn't contain harmful lead. But it does contain solvents and driers, just like the clear finishes mentioned earlier. So you'll want to let it cure for at least 30 days after it's applied to the toy.

So even if you don't choose a product labeled food safe, the toy you've finished will still be safe for the child.

Do you have any questions for us?

If you have a question related to woodworking techniques, tools, finishing, hardware, or accessories, we'd like to hear from you.

Just write down your question and mail it to us: Woodsmith Q&A, 2200 Grand Avenue, Des Moines, Iowa 50312. Or you can email us the question at: woodsmith@woodsmith.com.

Please include your full name, address, and daytime telephone number in case we have questions.

Sources

DRILL BITS

Although brad point bits, like the ones in the article on page 10, are available from a number of sources, not all brad point bits are created equal. *The Best Things* carries *Miebach "Colt"* brad point bits. These high-quality bits are made in Germany and drill cleaner holes with less tearout.

The *Morris Wood Tool Co.* is the only company that still makes genuine Forstner bits. They also make the end grain (custom order) and V-point bits shown in the article, as well as a large selection of brad point bits.

CIRCLE JIGS

Jasper Tools makes the circle jigs shown in the article on page 12. The three jigs can be purchased separately or in combination sets from a variety of woodworking retailers listed in the right margin. We purchased ours from *The Woodsmith Store.*

SLANT-SIDED PINE TOTE

There's not much in the way of hardware for the tote on page 16. We used decorative, pyramid head black iron screws from *Horton Brasses* (PH-6).

The paint on the tote shown on page 18, is *Benjamin Moore Regal Matte Covington Blue* (HC-138). The box also has an undercoat of *General Finishes' Mahogany* oil-base stain.

FILE STORAGE CABINET

The file storage cabinet that begins on page 20, uses 18" full-extension drawer slides by *Accuride* from *Rockler* (32490). *Blum* makes the *Metafile* file hangers used inside the drawers, also available from *Rockler* (70326). The drawers open with card frame drawer pulls from *Lee Valley* (01A57.60).

The profile on the trim was routed with a classical bead and cove bit from *Amana Tool* (54106).

The stain used on the file cabinet was *General Finishes' Light Oak* oil-base stain.

LIBRARY TABLE

Classic Craftsman-style furniture, like the library table on page 30, deserves classic Craftsman-style hardware. So we chose the dark bronze bail pull from *Lee Valley* (01A28.40). The figure-eight desktop fasteners that anchor the top came from *Rockler* (21650).

The profile on the inside of the drawers was routed with a two-flute ogee bit by *Amana Tool* (54120). *Amana* bits are available from *The Woodsmith Store.*

To finish the table, we used *Varathane's Early American* wood stain to further enhance the Craftsman look.

TABLE SAW TUNE-UP

Any time is a good time to make sure your table saw is in perfect working order. The dial indicator shown in the article on page 42, will help. It was purchased from *Woodcraft* (128397).

PASTE GRAIN FILLERS

A high-gloss surface on your finished wood project can be achieved with the help of the grain fillers featured in the article on page 46. *Natural Bartley Grain Filler* (77115) and *CrystaLac Wood Grain Filler* (34644) are both available from *Rockler.*

SAFE FINISHES

Mahoney Utility Finish is the walnut oil mentioned in the article on page 50. It was purchased from *Rockler* (26836). W

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MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

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800-444-7527
Circle Jigs, Paint, Router Bits, Stain

Amazon
amazon.com
Circle Jigs

Horton Brasses
800-754-9127
horton-brasses.com
Pyramid Head Screws

Jasper Tools
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Lee Valley
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leevalley.com
Drawer Pulls

Morris Wood Tool Co.
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morriswoodtool.com
Brad Point Bits
Forstner Bits

Rockler
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rockler.com
Circle Jigs, Drawer Slides, Figure-Eight Fasteners, File Hangers, Walnut Oil, Wood Grain Fillers

Woodcraft
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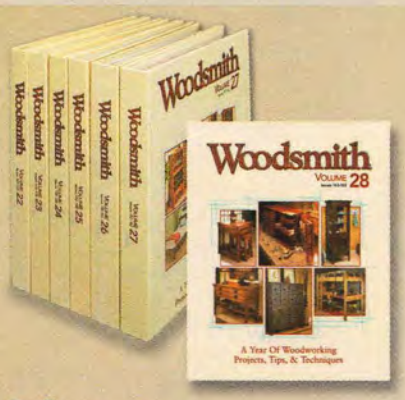

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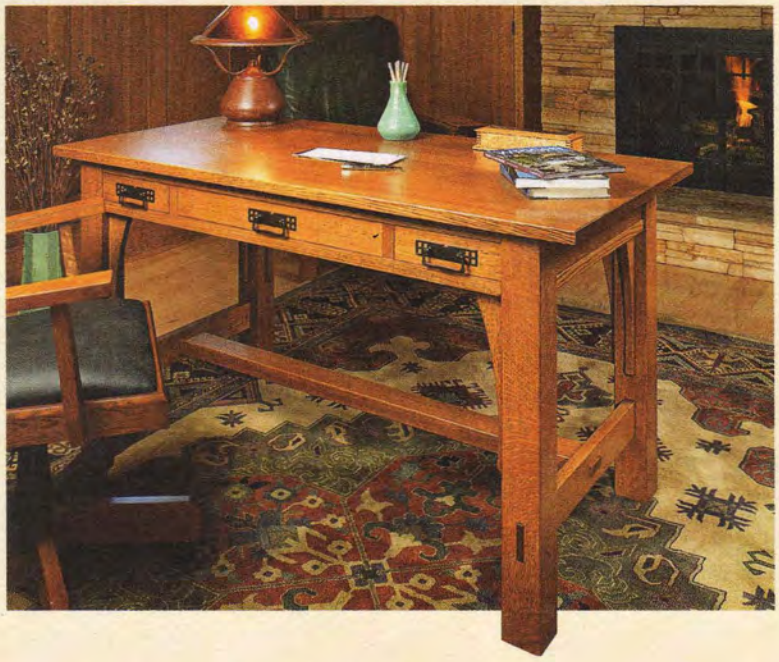
looking inside
Final Details

▼ *Slant-Sided Tote.* Here's a great-looking, easy-to-build project with lots of different uses. And the bonus is that for a small project, it still offers a nice range of woodworking — from basic joinery to a neat, bent lamination technique. Turn to page 16 to get started.

▲ *File Storage Cabinet.* Patterned after an old-style library card catalog, the eight small "drawers" in the handsome case are actually two file-size drawers. And unlike the flimsy metal versions, this sturdy file cabinet is built to stand up to rugged use. The construction is surprisingly straightforward and we'll give you all the details starting on page 20.



◄ *Craftsman Library Table.* A classic design that's practical and solid as a rock — that pretty well sums up this library table. As you can see, it's the perfect size for a small desk. And the woodworking is down-to-earth. You'll find everything you need to know in the article on page 30.